

**The National Science Foundation
Office of Polar Programs
Polar Environment, Safety & Health**

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NSF Office of Polar Programs Safety and Occupational Health Policy

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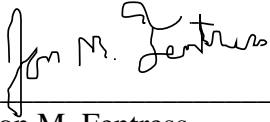
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Approved by:



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Jon M. Fentress

Date

NSF OPP Safety and Occupational Health Officer

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1. Purpose and Objective

The purpose of this policy is twofold: to establish a comprehensive accident and illness prevention program for the National Science Foundation's Office of Polar Programs (OPP) which supports research in some of the most hazardous environments on Earth both in the Arctic and Antarctic regions, and to provide guidance and procedures for policy compliance and implementation.

This document provides the *minimum* safety standards that OPP expects, which help ensure that workers, researchers, and other stakeholders are protected from hazards and that risk is mitigated to the lowest achievable level, while still allowing the science mission to be accomplished. Some of the specific objectives are:

- integrating appropriate safety standards into all engineering, construction, operating, administrative, research, and maintenance activities;
- requiring safe performance of all OPP contractor activities;
- creating and maintaining safe working conditions for all personnel involved in OPP-supported operations and research, as well as any others who might visit OPP-supported sites; and
- producing finished facilities and projects that provide an inherently safe environment.
- creating a proactive safety climate where risk management is something we live together and not merely something we do alone.

Tasking and funding are negotiated through Annual Program Plans. NSF OPP expects to pay for the services and supplies needed to be compliant with the policy.

2. Applicability and Compliance

The policies and procedures herein are applicable to all OPP stakeholders, to include contractors and grantees. Research stations and other offices are responsible for supplementing this regulation with standard operating procedures (SOPs) if deemed necessary. This policy supersedes any past safety policy or contractor safety policy and compliance is required with the latest version.

3. References

- Parts 1910, 1926, and 1960, Title 29, Code of Federal Regulations (OSHA).
- NFPA Life Safety Code
- National Electric Code
- International Building Codes (ICC)
- EM 385-1-1, U.S. Army Corps of Engineers (USACE) Safety and Health Requirements Manual

4. General Safety Policy

It is the policy of OPP that all proactive safety measures are taken so that individuals executing OPP's polar science mission do so in safe working conditions, beyond the typical hazards and risks associated with polar environments. It is the responsibility of individuals to perform their duties in a safe manner. This includes following processes and procedures outlined in safety and occupational health (SOH) training and using correct and appropriate tools and personal protective equipment (PPE).

SOH considerations shall be integrated into the development of all OPP research and project plans. All stakeholders will ensure that a risk assessment is executed for the research activities and projects for which they have authority and/or responsibility. For any research activity or project that is found to have a medium to high risk, based on the probability of a safety incident occurring and the severity of loss if one does occur, a safety professional must be consulted to ensure risk is mitigated to acceptable levels and that an accident prevention plan is developed and implemented. This accident prevention plan shall be documented and available for OPP review.

Note Certain risk is inherent in the environments in which Polar Programs operate, but no more than what is necessary to accomplish research shall be accepted.

4.1. Responsibilities of Personnel

All participants are required to comply with all applicable OPP safety requirements, including those in the contractor's site-specific accident prevention plan.

Supervisors are responsible for the safe conduct of all work under their control. They shall be familiar with all recognized codes, standards, and regulations relevant to their work and ensure that such requirements are strictly enforced. These include all applicable OSHA standards and applicable host nation requirements.

A safety briefing shall be provided to all visitors (including Distinguished Visitors) and researchers when possible. The names of attendees and the topics covered at this briefing shall be documented. Before starting their duties, supervisors will ensure all employees receive a safety orientation that covers hazards in the work environment and other essential safety information. Research team leaders, in coordination with the contractor, shall ensure that field teams have the training necessary to safely complete proposed research activities.

Employees will report any workplace accidents or injuries to their supervisor. Guidance for reporting accidents and mishaps is found in Appendix 3 of this policy.

4.2. Accident Prevention

Accident prevention measures must be integrated into all activities and operational procedures supported by OPP.

4.3. Risk Management

Composite risk management shall be integrated into implementing OPP-funded research. The five basic steps of composite risk management are: (1) identify the hazards, (2) assess

the hazards to determine risks, (3) develop risk-mitigating controls, (4) implement the controls to eliminate or reduce the hazards, and (5) supervise the implementation of controls and evaluate their effectiveness.

4.4. Suspend Operations

It is the policy of OPP that anybody who observes an activity or operation that poses a risk to safety of personnel or equipment can temporarily stop that activity until whoever is the senior responsible person is notified and reinitiates the activity. This can be a contractor to contractor, contractor to grantee, grantee to contractor, or any other possible combination.

For activities where an unsafe condition is observed and where risk has not been mitigated properly, those activities shall be suspended until the safety issue is corrected. After that and before reinitiation of the activity, the government senior responsible authority must be the one to allow the activity to resume. Further, these types of suspensions shall include the Contracting Officer's Representative and Contracting Officer (CO) where applicable.

It is the policy of OPP to suspend operations when all attempts to secure compliance with safety requirements have failed for any activity funded by OPP. A suspend-operations order will be issued only after noncompliance has been discussed with representatives from the project and it is evident that suspension of work is the only means through which compliance can be secured. For contractor operations, the NSF contracting officer (CO) has the authority to issue an official stop-work order, withhold payment, or assign an unsatisfactory safety evaluation to contractors who fail to comply with safety requirements.

For research teams who are receiving direct logistical and operational support from NSF OPP contractors and who are not performing as safely as possible or not taking safety direction from contractor management to make changes to mitigate risk, NSF OPP reserves the right to temporarily stop the research until the institution or university intervenes. This protects research teams and any others having to work in the vicinity from serious injury or fatality.

5. Procedures

5.1. Reviews

All research plans, specifications, designs, technical publications, and operating procedures will be reviewed for conformance with established safety codes and standards. The NSF OPP Safety Officer will provide review assistance where needed. The NSF OPP Safety Officer shall be the final authority in determining compliance with SOH requirements.

5.2. Occupational Safety and Health (OSH) Act Standards

Even though the Occupational Safety and Health Administration (OSHA) does not have jurisdiction in certain regions, OPP requires compliance with OSHA standards, as well as with NFPA (National Fire Protection Association) standards, local standards, the NEC (National Electric Code), and the IBC (International Building Code), among others. New

construction engineering and existing facilities engineering shall comply with the latest version of the IBC.

If compliance with a specific requirement cannot be met due to conflicting circumstances, practices, laws, regulations, or the unavailability of equipment, a waiver/variance request shall be made to the OPP Safety Officer. The OPP waiver/variance form (PESH-FORM_2000.10-4) must be used (see Appendix 17). The OPP Safety Officer will endeavor to respond in a timely manner. However, failure to respond does not constitute approval.

In cases where waivers/variances must be expedited due to immediate life safety issues and the OPP Safety Officer is not available, the NSF representative, NSF station manager, contracting officer's representative (COR), or OPP activity based manager (ABM) for the specific activity shall request that an activity hazard analysis (AHA) be conducted and approved by the prime contractor's safety lead. The AHA shall provide for risk mitigation, using the proposed alternate means, process, or equipment equivalent to whatever the initial code or requirement would have provided. A completed waiver/variance form shall be provided to the NSF OPP Safety Officer, along with the AHA, no later than five days after implementation of the proposed alternative.

5.3. Explosives and Other Dangerous Articles

Any group, agency, or organization planning to transport explosives *or other material with explosive or serious fire potential such as certain types of fuel or other hazardous materials*, shall ensure that all individuals with a need to know are notified of the movement ahead of time so that precautions can be taken to mitigate the risk of an explosive incident. An SOP for this shall be developed by the group, agency, or organization, with the distribution list verified and shared with all stakeholders.

When the need to use explosives is identified, the group's, agency's, or organization's safety office or explosives subject matter expert (SME) will develop an explosives safety plan. This safety plan shall be developed by a qualified and experienced explosive expert, and it shall outline the method of storage, transportation, and operation, as well as the precautions that will be taken to control all hazards. A copy of the plan shall be kept on file by the team using the explosives at the site where the explosives are to be used. The plan shall be readily available for review if requested by OPP. See also High Risk Safety Planning in Appendix 2.

5.4. Health Hazards

Potential health hazards from highly toxic materials, as identified on the materials' Safety Data Sheets (SDS), or from their disposal or the work environment in which they will be used, will be thoroughly evaluated before the materials are procured or shipped to their area of use. Preventative measures, surveys, and inspections shall be required to control such hazards. Plans, designs, operations, or research using new materials that involve serious, life-threatening health hazards must be brought to the attention of OPP before the materials are deployed.

For science or research, radiological safety concerns shall be addressed by the home institution's Radiation Safety Officer prior to deployment. Radiological material shall be

identified in the proposal and approved by NSF OPP before transport to either Summit Station or Antarctica (See Appendix 14, Research Safety).

5.5. Safety Surveys and Inspections

At a minimum, all operational areas at a research station (and other locations, when possible) shall be surveyed and inspected two or three times a week by someone with knowledge of the safety requirements/standards associated for potential safety hazards. These safety inspections should occur daily during operations and maintenance (O&M) and construction work. All findings not in compliance with safety requirements, codes, and standards shall be identified, tracked, prioritized, and corrected as soon as possible.

There shall be a central location where all safety related permits, AHAs/JHAs, Accident Prevention Plans or other risk documents are stored near where significant activities are being performed.

6. OSH Programs for U.S. Federal Employees

Executive Order 12196, Occupational Safety and Health Programs for Federal Employees, made each Federal agency head responsible for establishing and maintaining an effective and comprehensive Occupational Safety and Health Program. The OSH Act is therefore applicable to all OPP employees and will be complied with in applicable workplaces. The rights and responsibilities of employees, as delineated in Title 29 CFR, Part 1960, Federal Employee Safety and Occupational Health, will be implemented. All Federal Employees on-site shall comply with the contractor's site-specific accident prevention plan at all times.

7. Policy Review

This policy is valid until rescinded. It will be reviewed at an interval of not more than two years, unless serious incidents or trends not currently identified require additional information and policy revision.

8. Distribution

All OPP stakeholders.

9. List of Acronyms

Acronym Definitions	
AAUS	American Academy of Underwater Sciences
ABM	Activity Based Manager
ACO	Administrative Contracting Officer
AHA	Activity Hazard Analysis
AHJ	Authority Having Jurisdiction
ANSI	American National Standards Institute
ATV	All-Terrain Vehicle

Acronym Definitions	
BOI	Board of Investigation
CAGE	Cerebral Arterial Gas Embolism
CE	A mark indicating a product complies with the requirements of the relevant European legislation regarding the environment, safety, and health; literally “Conformité Européene”
CFR	Code of Federal Regulations
CGA	Compressed Gas Association
CO ₂	Carbon Dioxide
CO	Contracting Officer
COR	Contracting Officer's Representative
CPR	Cardiopulmonary Resuscitation
CR	Change Request
dBA	A-weighted decibels (an expression of the relative loudness of sounds, as perceived by the human ear)
DCS	Decompression Sickness
DHHS	Department of Health and Human Services
DOD	Department of Defense
DOT	Department of Transportation
DSO	Diving Safety Officer
EPA	Environmental Protection Agency
FAR	Federal Acquisition Regulations
FOIA	Freedom of Information Act
FOPS	Falling Object Protective Structures
GFCI	Ground Fault Circuit Interrupter
GPS	Global Positioning System
IBC	International Building Code
ICC	International Code Council
IDLH	Imminently Dangerous to Life and Health
IFC	International Fire Code
LEL	Lower Explosive Limit
LFL	Lower Flammable Limit
NEC	National Electrical Code
NFPA	National Fire Protection Association
NIOSH	National Institute for Occupational Safety and Health
NRC	Nuclear Regulatory Commission
NSF	National Science Foundation
O&M	Operations and Maintenance
OPP	Office of Polar Programs
OSH	Occupational Safety & Health
OSHA	Occupational Safety & Health Administration
PEL	Permissible Exposure Limit
PESH	Polar Environment, Safety & Health
PFD	Personal Flotation Device
PI	Principal Investigator

Acronym Definitions	
PPE	Personal Protective Equipment
ppm	Parts per million
RAC	Risk Assessment Code
SAE	Society of Automotive Engineers
SDCB	Scientific Diving Control Board
SDS	Safety Data Sheet
SME	Subject Matter Expert
SOH	Safety & Occupational Health
SOHO	Safety & Occupational Health Officer
SOP	Standard Operating Procedure
STS	Standard Threshold Shift
T-Event	Technical Event (third-party organization deploying to Antarctica to repair a science project's equipment).
TLV	Threshold Limit Values
USACE	U.S. Army Corps of Engineers
USAP	United States Antarctic Program
UL	Underwriters Laboratories (an independent, not-for-profit testing laboratory)
UV	Ultraviolet (in referring to radiation)

Appendix 1: Organizational Responsibilities

In order to ensure an effective accident prevention program is in place and functioning, all elements within the organization must be held accountable for safety and health performance. Safety performance should be included in all individual performance reviews and as part of the formal contract performance evaluation.

Purpose

The purpose of this appendix is to define the specific SOH responsibilities of OPP participants and stakeholders.

Safety Responsibilities and Authorities

OPP Director

The Director has delegated responsibility for establishing SOH policy to the NSF OPP Safety and Occupational Health Officer. The OPP Safety Officer is also responsible for acting on safety and occupational health issues requiring specific actions, interpretations, or directives.

Contracting Officer Representatives (CORs)

The COR is designated by the CO (Contracting Officer) to ensure contract specifications are complied with, which includes any relevant safety and health requirements or standards. The COR is ultimately authorized by the CO to approve funding in support of the contract specifications, up to specific amounts. Due to the size and complexity of the USAP, the COR has authorized ABMs (Activity Based Managers) to recommend funding approval for specific programs.

NSF Safety and Occupational Health Officer

- The NSF OPP Safety and Occupational Health Officer (Referred to as the Safety Officer) reports to the Director. The purpose of this arrangement is so that safety oversight in OPP is autonomous and independent of either the Antarctic or Arctic programs and not be subject to conflicts of interest (e.g. budget pressures) but strictly focused on over all program risk mitigation.
- The OPP Safety Officer has the authority to intervene in all safety and health activities and, where feasible (and within funding constraints), should also have access to all sites, research stations, and contractor safety personnel (among others).
- The OPP Safety Officer also:
 - develops safety and occupational health policy.

- develops specific procedures to protect personnel, property, and the environment in cases where OPP feels it needs to be more direct in ensuring risk mitigation, in order to avoid interruptions to the OPP science mission;
- ensures that contractor safety and health requirements, standards, best business practices, and this policy are being complied with across all OPP-supported activities and sites, so that risk is mitigated to acceptable levels;
- tracks accident trends across OPP activities and passes along lessons-learned to ensure prevention of future, similar incidents;
- makes determinations on waivers and variances to SOH requirements and standards, with COR concurrence, for any risk-mitigating recommendations that may require funding approval, as proposed by the contractor (specifically the contractor's safety lead);
- ensures proper investigation of all recordable accidents and ensures that corrective actions are implemented; and
- performs risk analysis and provides risk-mitigation recommendations on SOH matters, as requested.

OPP Area Based Managers (ABMs)

ABMs:

- ensure they are familiar with the safety and occupational health requirements within their programs and ensure proper risk mitigation which may entail a request to the NSF OPP Safety Officer for support;
- ensure that safety and health planning activities, such as design reviews, specification development, O&M work, and research proposals have all been reviewed for inclusion and compliance of safety and health requirements; this may mean consulting with NSF OPP Safety Officer for risk-mitigated solution recommendations;
- ensure designers use methods and techniques that prevent or reduce hazards associated with use of proposed equipment, processes, or facilities; and
- take action immediately, in consultation with the NSF OPP Safety Officer, when SOH non-compliance is identified to ensure corrections are made to prevent injury or property damage; for immediate-danger-to-life-and-health (IDLH) items, work and/or research must be stopped until these can be corrected.

Contractor Safety Responsibilities and Authorities

Prime Contractor's Leadership

Safety starts with senior contractor leadership. It should be clearly evident to OPP that senior leadership for the prime contractor supports and values the OPP safety policy described in this document through behaviors, decisions, and actions. The leadership:

- shall ensure compliance with 29 CFR 1910, 1926, the National Fire Protection Association (NFPA), the National Electrical Code (NEC), and the International

Building Code (IBC) (2015), among other U.S. standards, during all operations and activities under their control and authority;

- shall ensure the organization has an established and documented safety and health program that emphasizes proactive safety measures, and that has a clearly evident process for accountability;
- shall ensure the contractor safety office is staffed appropriately to meet OPP mission support requirements, as identified by OPP; and
- shall ensure that supervisors know their safety responsibilities and have supervisory safety training as needed to be successful;
- shall recognize exceptional safety performance by teams in the field, thus fostering a safety culture in which hazards are reported openly and employees protect one another. There shall be no retribution for any subcontractor or employee reporting a safety hazard or incident to either the OPP or contractor management, except where a blatant disregard for safety was identified or, in the case of a repeat offender, where the individual had all of the proper (and documented) safety training, PPE, and supervision required yet still committed the safety infraction, even after being counseled for a previous, similar issue.

Contractor's Safety and Health Team

The prime contractor shall ensure all subcontractors comply with this policy. The prime contractor is responsible for each subcontractor's safety performance. The prime contractor's safety and health team shall:

- *have the training, education, and experience needed to ensure the broad range of safety oversight necessary to provide the required safety oversight and ensure risk mitigation.*
- be authorized to represent the NSF OPP Safety Officer in regard to enforcement of this policy and the safety standards and processes within except for requirements pertaining to government employees;
- ensure continuing inspection of job sites for compliance with contractual requirements;
- ensure work meets the requirements of the Code of Federal Regulations (CFR) 1910 and 1926 or other SOH standards and requirements, where applicable;
- develop and submit accident prevention plans and activity hazard analyses for all O&M and construction projects before physical work begins which include fatigue management. Accident prevention plans and activity hazard analyses shall be forwarded to the NSF OPP Safety Officer for review and acceptance when risk assessment code (RAC) for an operational or research project is medium or high, as identified during the risk management process;
- provide preliminary accident notification information to the NSF OPP Safety Officer within 24 hours and a completed Polar Accident and Investigation Form to the safety office within five days for all recordable accidents or injuries;
- review all accident reports to ensure they are complete;
- ensure action is taken to prevent a recurrence;
- ensure a weekly toolbox safety meeting is executed at all sites;

- require field personnel to include all safety findings in reports, whether negative or positive, track these on a log, and ensure correction based on priority (and approved funding, when needed);
- ensure that adequate fire prevention and protection programs, as well as emergency response plans, are established for all sites and that exercises and drills are performed and documented as required;
- ensure personnel receive relevant safety training on a regular basis, or as required by the Code of Federal Regulations, specifically 1910 and 1926;
- ensure all new field personnel receive a safety orientation;
- ensure all employees with potential exposure to noise levels exceeding OSHA's time-weighted average of 85dba (29 CFR 1910.95) or exposure to hazardous chemicals or toxic wastes (29 CFR 1910 Subpart Z) are placed in a medical surveillance program to ensure their safety and health (Note: the contractor should have this as part of its safety program and should expect no additional funding for these OSHA required protective measures);
- provide the necessary PPE for each employee, and ensure training is provided on the proper use of PPE;
- provide safety briefings for visitors, to include distinguished visitors (DVs);
- evaluate safety performance and develop a programmatic reward system between subcontractors;
- keep OPP advised as to findings and make recommendations for changes or improvements where conditions warrant;
- ensure all accidents are investigated and corrections identified and implemented in a timely matter;
- ensure designers use methods and techniques that prevent or reduce hazards associated with the use of proposed equipment, processes, or facilities;
- ensure direct SOH oversight for any activities that have these hazards:
 - Excavations five feet in depth or at any depth there is a hazard
 - Potential falls from heights six feet during construction or four feet for general industry
 - Exposure to hazardous chemical or biological substances
 - Work less than ten feet from high voltage lines
 - Underground earth work or work involved in creating or expanding snow or tunnels
 - Potential danger of drowning
 - Work with ionizing radiation or explosives
 - Work involving assembling or dismantling heavy prefabricated components (10 tons or greater)
 - Projects with a potential of blasting
 - ANY permitted confined space work

Researcher Safety Responsibilities and Authorities

Grantees and Principal Investigators (PIs)

Grantees are responsible for safety and health in their respective activities, and they are responsible for the safety and health of their research teams. PIs shall:

- ensure that each person working under their grant has reviewed and is knowledgeable of the safety and health requirements related to the research project;
- comply with, implement, and enforce all safety and health requirements for research personnel and their activities, as identified in the contractor's accident prevention plan or any other contractor safety SOP, as well as any specific safety and health requirements in the award, when at a contractor-supported research station, in a contractor-supported facility, or on a contractor-supported vessel;
- report at a minimum all recordable (as defined by OSHA) safety incidents to the contractor camp manager or the contractor's safety office, as well as to the NSF OPP Safety Officer (Jon Fentress, jfentres@nsf.gov); reporting is to ensure prevention of future incidents and will not be utilized for punitive actions but for sharing lessons-learned with others; for the USAP, researchers shall utilize the modified EINF form (contact ASC Safety for more information);
- identify and assess the relative safety and health risks of each grant-related activity and ensure that written procedures are in place to minimize risk to research teams and others that may work in the vicinity; the written safety procedures shall be kept as close to the actual research work as possible for review by the team if needed;
- ensure that safety and health issues are addressed early in the planning and proposal stages and are integrated throughout the project life cycle; and
- ensure that research team members have received safety and health training appropriate for the duties to be performed, before they deploy, if possible, but at a minimum before they start research-related activities.

Appendix 2: Accident Prevention Plans

Purpose

The purpose of this appendix is to prescribe guidelines and requirements for implementing accident prevention plans.

Policy and Scope

It is mandatory that prime contractors, grantees, and NSF OPP partners such as the NZDF or NAVCHAPs comply with the safety expectations and requirements outlined in this policy and in the Code of Federal Regulations, and assume responsibility for sub-contractors or personnel performing activities. In order for NSF OPP to be confident that these vital safety requirements have been included in planning, an Accident Prevention Plan shall be developed. For High Risk Activities, these plans shall be submitted to the NSF OPP Safety Officer and relevant Program Officer/Manager for review and concurrence prior to the start of the activity.

General Requirements

Safety and accident prevention plans are necessary to ensure personnel performing OPP-supported activities are provided controls for protecting their life and health and the life and health of any other personnel in the vicinity of operations, preventing property damage, and avoiding interruptions in the performance of their work. It is imperative to anticipate as much as possible emerging hazards during the project life cycle and ensure that risk is incorporated into risk planning.

High risk activities, such as non-routine use of explosives; diving; work at heights greater than 20 feet; repeated entry into permit-required confined spaces with oxygen deficient atmospheres; traverses across crevassed zones; crane critical lifts (two cranes lifting a single load, a crane lifting a blind load, or a crane lifting a load that exceeds 75% of the total capacity of the crane); ship operations for unloading and loading cargo, to include shooting lines; or other similarly high-risk-to-life activities shall require that a site- and job-specific safety plan is submitted to the NSF OPP Safety Officer and the relevant COR and/or program manager (PM) for review. Physical operations or activities in these areas cannot start until the plan is found acceptable by all reviewers.

One premise of this process is to ensure that there truly is no other way to accomplish the work other than the proposed process. These high-risk safety plans shall be concise (submitters should not copy all of the relevant OSHA standard(s) word for word but rather provide details on how they plan to implement the standards and requirements specifically), and they shall contain the following sections:

1. A description of the work, including starting date, specific location (include a map, if appropriate), activities, and phases.
2. Name of plan preparer, including qualifications and experience.
3. Reasons this cannot be performed in any other fashion, and provide some of the other possibilities that were considered and why they would not work. "It's just always been done this way" is not an acceptable reason.

4. Details of the activity and associated hazards and specifically how those hazards will be controlled and/or managed. Who is doing what, when, where, and how, and what equipment will be used? If using explosives, what kind, how much, where will they be stored, how will they be transferred, how will they be triggered, and what will be the process on this project for managing explosives that do not ignite? In this section, also identify the specific safety training personnel have received in order to accomplish the work or operation safely.
5. The name (if available) of the person ultimately responsible for safety on the project. This can be provided to NSF OPP later if not known at the time of plan development.
6. A list of any coordination that was done or will be done with other agencies or organizations (e.g. New Zealanders and Navchaps for end-of-season ship operations), , who the contact was, and contact information. Discuss briefly any safety coordination efforts executed.
7. Emergency plans and contacts. Evidence of contact with the fire department, if applicable. Identify any recent emergency drills that might have been performed that would reassure OPP that if there was an emergency, an efficient response to save life might occur.
8. Include the activity hazard analysis (AHA) utilized to complete the plan.

Contract Specifications

In addition to complying with 29 CFR 1910 and 1926, the specifications for all OPP activities and contract work shall include such additional requirements as are necessary to ensure a high standard of physical protection and safety performance by those individuals performing these activities. Operations and maintenance, construction, engineering, planning, research, and any other offices involved in field activities will take note of all hazards inherent in the location or terrain and will implement precautionary measures.

Accident Prevention Plan and Pre-Construction or Pre-Activity Conference

1. After award of a contract, the contractor shall develop an accident prevention plan that demonstrates compliance with the contract to develop, establish, and manage a safety program that meets federal law (OSHA) and provide it within 2 weeks of the planned start of the activity.
2. A copy of the accident prevention plan will be kept on file for OPP review, if needed. One plan is required for O&M contracts and one for major construction beyond that deemed to be O&M activities. Within this risk mitigating plan, the AHA for the initial work phase will be included with the others to be developed as construction continues through the next phases. Before work is initiated, the contractor shall meet in conference with the OPP program managers responsible for the work activity to discuss the accident prevention plan, inherent and specific hazards of the contemplated operations, and other aspects of the contracted work, as necessary. Written minutes containing the understanding reached at this pre-work conference will be furnished to the contractor and kept on file. There shall be no field work initiated until this step is accomplished.

3. The NSF OPP Safety Officer shall be informed of the pre-work meeting for large operations or construction in sufficient time to permit attendance.
4. The pre-work meeting agenda should be developed to meet the specific risk challenges and unusual features of the job. Consideration should be given to any previous experience of the contractor on OPP-supported work. The following safety topics are suggested for the agenda, where applicable:
 - A. Identification and accountability of contractor personnel responsible for accident prevention.
 - B. Site safety officers shall have completed, at a minimum, the OSHA 30-hour construction safety course or equivalent.
 - C. The anticipated level of medical support shall be identified for each location/project/field camp/traverse/vessel/research site.
 - D. The establishment of a mutual understanding regarding the purpose and function of an AHA process.
 - E. A review and discussion of the hazards and remedies submitted by the contractor, leading to an agreement upon the methods used to recognize, evaluate, and control the hazards.
 - F. Purpose and advantages of an effective safety program.
 - G. A review of the accident prevention clause of the contract and the general and special conditions of the specifications, with emphasis on the contractor's regular safety inspections and records.
 - H. A list of local, site-specific requirements that must be complied with (e.g., blasting, respiratory protection).
 - I. How the contractor proposes controlling and coordinating the work of subcontractors.
 - J. Discussion of key items in the contractor's proposed plan. Where not clearly indicated in the proposed plan, the following items, at a minimum, should be developed:
 - i. Method(s) by which the contractor will enforce safety.
 - ii. Plans for dealing with snow drifting and for runway construction and/or maintenance.
 - iii. Methods that the contractor will use to control and coordinate work with others having operations at the same location.
 - iv. Plans for laying out temporary construction buildings and facilities.
 - v. Plans for initial indoctrination and continued safety education for all employees.
 - vi. Plans for controlling traffic and marking hazards on roads, utilities (both below ground and overhead), bridges, and restricted areas.
 - vii. Plans for job cleanup.
 - viii. Plans for fire protection, hot-work permits, and dealing with emergencies (e.g., medical emergencies, fires).
 - ix. Arrangements for providing adequate lighting, ventilation, personal protective equipment, and medical care (to include safe transport).

- x. Plans for inspecting the job site by competent persons, to include reports to be kept, results of inspections, and corrective actions taken.
- xi. Plans for prompt action by the contractor to correct deficiencies reported by OPP or other OPP-authorized representatives.

Contractor Activity/Job Hazard Analysis (AHA).

An activity or job hazard analysis (see Appendix 17 for an example) shall be developed at the beginning of any "major phase" of O&M work and construction. At a minimum, any definable feature of work shall have an AHA. The purpose of the AHA will be to review the specific hazards anticipated and the specific measures planned to eliminate them.

"Major phase" pertains to significant items of work, such as renovation, demolition, drilling, land clearing, excavation, road relocation, pile driving, concrete placement, building construction, installation of equipment, steel erection, use of hazardous materials, electrical work, installation of heating, and ventilating and air conditioning.

Inspection and Approval of Assets

The contractor shall have available onsite for review, if needed, the required inspection records and tests indicating compliance with manufacturer and OSHA requirements for infrastructure, facilities, and other assets (e.g., cranes, fire protection systems). Equipment failing to meet the requirements will not be used, pending compliance. Whenever defects are noted that will render the equipment unsafe, the contractor will be promptly notified of the specific corrective action required and directed to withhold equipment operation until corrective action has been taken and the COR advised of the completed action.

Use of "Stop Work Order"

If all attempts to secure voluntary compliance with safety requirements are not successful, the contract officer (CO) or COR may issue a stop work order. It is important that the order applies only to that portion of the work that is affected by the actions or inactions of the contractor, and that all of the facts of the proceedings are documented in writing, including noting uncorrected safety violations. The contractor shall be informed in writing of the extent of the work stoppage, the date and hour work has stopped, the reason for the action, and the conditions under which work may proceed again. The NSF OPP Safety Officer shall be notified immediately of such action.

Responsibility of Inspectors in Cases of Immediate Hazard

Whenever the OPP or prime contractor's safety professional observes an activity or situation that constitutes a risk to life or limb, he or she will immediately take the following measures:

- The safety professional will require the contractor's representative to remove workers immediately from the area of danger and refrain from the dangerous practice.

- If the contractor's representative is not at the location of the dangerous condition, the inspector will direct the workers to remove themselves from the site and cease the hazardous operation.
- The inspector will ensure that work is not resumed in the area of danger and that the defective methods, SOPs, equipment, tools, scaffolds, etc. are not used again until the recommended corrective action is taken.

The safety professional will immediately report any of the above actions and any noncompliance, along with his or her recommendations, to an immediate supervisor, and the inspector will document observations.

Reckless Employees

NSF OPP has a zero tolerance to reckless and purposely unsafe behavior or the placement of anyone in a known and imminently unsafe situation where the risk of a serious injury or fatality is great and unmitigated.

When a contractor employee or grantee purposely endangers his or her own well-being or the well-being of others by flagrant disregard of known safety regulations, the individual or individuals shall be immediately removed from the hazardous exposure (if possible) by contractor management and OPP, and the Code Of Conduct process will be utilized to determine the most appropriate response thereafter (See the Polar Code of Conduct, OPP-POL_6000.01).

For grantees, the institution or university may also be contacted by OPP to discuss the incident so that action from that venue can be executed to ensure correction of behavior(s) in the name of safety and so that re-initiation of the research can begin safely.

Appendix 3: Accident Investigation and Injury Reporting

Purpose

The purpose of this policy and these procedures is to: 1) establish the requirement for accident reporting and investigation within OPP programs; 2) standardize the process to improve efficiency; and 3) ensure that all accidents are reported in accordance with 29 CFR Part 1904, "Recording and Reporting Occupational Injuries and Illness."

*Accident investigation is not to be used for disciplinary purposes but simply to learn so that prevention of the same or similar type incident does not occur in the future.

Applicability

This appendix applies to all OPP personnel and contractors, to include grantees. Compliance is requested by Department of Defense (DoD) personnel, who have their own reporting and investigation process, so that risk information can be shared in an effort to improve safety for all participants.

Reporting Requirements

The following reporting requirements apply to all contractor personnel, whether on duty or off, and all contractor activities performed on OPP-supported research stations, research vessels, projects, or activities. Contractor safety personnel shall capture reports from grantees and ensure proper reporting to NSF OPP.

Serious Accidents

For any accident that results in (or have a high probability of resulting in):

1. injuries to ANY personnel with the following consequences:
 - A. fatality;
 - B. permanent total disability (the complete loss of any member or part of a member of the body, or any permanent impairment of functions of the body or part thereof, to the extent that the individual cannot follow gainful employment);
 - C. permanent partial disability (the complete loss of any member or part of a member of the body, or any permanent impairment of the functions of the body or part thereof);
 - D. three or more persons hospitalized,
2. damage of \$100,000 or more to OPP-supported property and/or equipment; or
3. significant adverse publicity,

the worksite supervisor shall immediately notify the prime contractor's safety office and contractor management by telephone and email. If there is an OPP representative or station manager on site, that individual shall also be immediately notified in the same manner, by either contractor management (if on site) or by the worksite supervisor. Upon being notified by the worksite supervisor, the contractor's safety office shall immediately notify

by email the OPP representative or station manager (if not on-site), the NSF OPP Safety Officer, and the responsible OPP program managers.

This immediate notification shall include, but not be limited to, the following (as applicable to the incident):

- Name of the participant(s) killed or injured, job, and specific location
- Identification of property (ownership) and/or equipment damaged and dollar estimate of damage
- Date and time of accident
- Location of accident, to include research station or project name
- Contract number and the name of contractor (and/or sub)
- Description, (who, when, what, why, and how) in as much detail as possible
- Immediate actions taken to control the hazard to prevent further injuries
- Any other information considered pertinent

The NSF OPP Safety Officer or designee, and possibly the relevant OPP program manager, shall travel as soon as possible and where practical to the site of all accidents that result in a fatality, taking into consideration travel conditions and environmental hazards.

All accidents of the above listed severity, unless determined otherwise by the NSF OPP Safety Officer, will be investigated by a board of investigation (BOI) appointed by the NSF OPP Safety Officer (see Appendix 3-1). Other incidents not listed above may require a BOI investigation, if determined appropriate or necessary by the NSF OPP Safety Officer. Members to serve on the BOI will be composed of technical and management specialists. The NSF OPP Safety Officer will manage this process and ensure the accuracy of the investigation.

If there appears to be criminal involvement, the criminal investigation will take precedence over the safety investigation. If the two investigations are concurrent, it is vital that the two investigations remain clearly separate, to include board members. The purpose of this is to ensure the safety investigation remains a non-punitive process, which results in a more open sharing of information that can help determine causation in order to prevent further loss of life, or any other serious loss.

The BOI report will include photos, sketches, diagrams, and other exhibits essential to presenting a clear picture of the incident. The original BOI report and three copies will be submitted to the NSF OPP Safety Officer as soon as practical but no later than 90 days. In unique circumstances, the deadline may be extended with a formal written (email) request from the Board chair to the NSF OPP Safety Officer when there are complex details associated which may include expert analysis (e.g. outside engineering analysis of equipment).

Less Serious Accidents

For any accidents not meeting the criteria above for serious accidents but still involving:

1. any injury requiring medical care beyond First Aid;
2. the operation of a vehicle (whether moving or halted) that results in injury, damage to the vehicle appearing to be beyond \$2000 (as estimated by vehicle

maintenance department staff or by somebody with the requisite knowledge), or damage to any other property beyond \$2000 but less than \$100,000;

3. damage beyond \$2000 but less than \$100,000 to any property, equipment, or material incident to an OPP-supported facility; or
4. explosions; fires involving ammunition and other explosives; exposure to microwave or ionizing radiation; chemical exposures; contamination or damage of property from biological, radiological, or chemical agents; crane accidents (no matter how minor); and confined space incidents (no matter how minor),

the contractor's safety office shall notify the OPP representative or station manager (whether on or off site), the NSF OPP Safety Officer, and the responsible OPP program managers within 24 hours of the accident. The email shall contain the same information as listed above (as applicable to the incident).

These accidents do not require a BOI. However, a formal investigation must still be undertaken and a formal accident report submitted to OPP no later than 30 calendar days after the incident, with updates provided to the NSF OPP Safety Officer every seven days that identify actions taken, actions upcoming, and overall status of the investigation. This formal report shall also contain a root-cause analysis (covering both direct and indirect causes), corrective actions to mitigate the risk of similar future accidents (and cost estimates), and a proposed timeline for corrective action implementation.

The following signature chain is to be used on the accident report to ensure review at all appropriate levels.

- Lead investigator (if other than the contractor safety manager)
- Contractor safety manager
- Contractor management (on-site)
- OPP program manager
- NSF OPP Safety Officer

Near Misses

Near misses, especially where a severe loss could have occurred, should be investigated and recommendations for prevention developed and implemented to mitigate risk of injury, fatality, or property loss. Near miss reporting is a positive indicator of a proactive safety culture and symbolizes that personnel truly have internalized the safety process and that leadership is communicating correctly that reporting of near misses and incidents is to prevent injuries and not for punishment.

Safeguarding Accident Information

Completed accident investigation reports and any attachments, copies, or extracts will not be appended to or enclosed with any other report or document, unless the sole purpose of the other report or document is to aid in accident prevention. Requests for copies of accident reports from outside OPP will be in writing and forwarded to OPP.

Accident Reporting Integrity

It shall be the responsibility of on-site managers to take reasonable steps to ensure that all accidents are properly reported. If injuries are mentioned through unofficial discussions, or if local medical clinics receive injuries, they should be reported to the prime contractor's safety office (while protecting personal information) to investigate whether the injury was work-related, as defined by OSHA.

Appendix 3-1: Board of Investigation (BOI) Procedures

A BOI will be managed and appointed by the NSF OPP Safety Officer. The OPP Safety Officer has complete autonomy as delegated by the OPP Director to ensure all OPP serious recordable incidents are thoroughly investigated and corrections implemented to prevent similar type incidents from occurring again. Funding for BOI appointees travel, per diem, and labor shall be made available as soon as possible. At a minimum, a BOI shall be appointed for:

- Any accident involving a fatality or permanent total disability to government, contractor, military personnel, *or grantee*, or damage of \$100,000 or more.
- Any accident for which OPP leadership determines a BOI is warranted.

*The contractor shall immediately initiate their own accident investigation as is required for serious recordable incidents but should not interfere with the government's investigation as directed by the NSF OPP Safety Officer. If a critical utility has been affected, the contractor shall take action to secure the utility and place back in service **ONLY** if immediate action is required in order to save life. The contractor should secure the scene immediately but leave all evidence in place and photograph the scene thoroughly. The contractor shall record initial witness statements and appropriate relevant personnel statements and have these signed and dated by the individual providing the statement. These shall be provided (along with any initial photos or other evidence) to the NSF OPP Safety Officer as soon as possible to share with the BOI appointees. The contractor can keep copies of any information provided to the government for their own investigation.

BOI Structure

The BOI will consist of at least three voting members. In addition, non-voting technical advisors may be appointed to facilitate the investigation.

1. The president of the board should be the most experienced and qualified individual, in regard to the type of incident, and he or she may not be the supervisor of the team or work area that sustained the incident.
2. The selection of board members will be based on their ability to analyze accident circumstances and causes, and develop corrective measures to prevent future similar accidents.
3. Board members will be government personnel only which may include military personnel. The board may involve the services of subject matter experts which are non-voting members.
4. The NSF OPP Safety Officer shall have authority over the board and investigation process and function as a direct advisor to the board president.
5. Both members and advisors will be appointed by a written memorandum that specifies:
 - A. Board members are requested to be relieved of their regular duties so they may give first priority to the accident investigation, until such time as the board report is submitted to and approved by the NSF OPP Safety Officer.

- B. Board members and advisors are responsible for following all privacy laws protecting personal information.
- 6. Investigation, analysis, and preparation of board reports will involve only those members and advisors, including their clerical support, specified in the appointment orders. The board report will not be prepared by or reviewed by anybody who doesn't have a need to know.
- 7. Appointment of the board shall be immediate (as able), and the NSF OPP Safety Officer will provide the board a list of objectives to accomplish.

Instructions for a BOI

Essential steps to be taken and reported on in the investigation will include, but not be limited to, the following. At a minimum, the board will:

- 1. Ensure a secure file transferring system is established (NSF OPP Safety Officer will assist with this).
- 2. Visit the scene of the accident as soon as possible after the accident occurs. A reconstruction of the circumstances is highly desirable if the scene cannot be kept intact from the time of the accident.
- 3. Illustrate clearly on drawings or charts all pertinent information of the vicinity.
- 4. Take photographs and accompany each with an accurate description.
- 5. Take statements from witnesses and supervisors. The statements should include:
 - A. Where the witness was at the time of the accident;
 - B. What action or operation was taking place immediately before the accident; and
 - C. How, in their estimation, the accident happened.

Note Written statements should be signed by the witness.

- 6. Establish the following facts about the accident (at a minimum):
 - A. How long the employee(s) involved had been employed on the job
 - B. Was/were the employee(s) qualified to perform his/her/their assigned duties?
 - C. Did employee(s) have any known physical impairments?
 - D. Was/were employee(s) familiar with safety requirements covering the work? If so, were safety requirements violated?
 - E. What unsafe act or condition caused the accident?
 - F. What safety instructions had been given by the supervisor?
 - G. Had the hazard or safety violation been called to the attention of the supervisor? If so, by whom and when?
 - H. Was the equipment involved in a safe operating condition? If not, by and to whom had this condition been reported and what action was taken?

- I. How could the accident have been prevented? (Include systematic weaknesses that contributed to the mishap).
 - J. What were the direct and indirect causes? (These should be described.)
 - K. Had a hazard analysis been completed and accepted for this particular operation or activity?
- 7. If conflicting evidence is obtained, secure enough additional evidence from reliable sources to resolve the conflict.
 - 8. If equipment testing is required, such as fire suppression CO2 heads, the equipment and reports shall be handled and directly provided to the board who will manage the chain of custody.

Instructions for Preparing a BOI Report.

- 1. Summarize testimony of witness in the discussion and do not include verbatim statements.
- 2. Resolve conflicts in testimony based on the best available evidence.
- 3. Identify witnesses only by job title or assignment, such as engineer or carpenter.
- 4. Include the following information (as applicable to the particular type of accident investigated):
 - A. A statement that the board of investigation is a safety evaluation of an accident and is not to be used for disciplinary purposes but to learn what to do to prevent the same or similar incident from occurring in the future.
 - B. BOI authorization and members.
 - C. Accident classification; name, age, and occupation of deceased (if any); equipment involved; date of accident; name of employer; name and location of project.
 - D. Accident description. Provide the scenario of the accident, describing the factual details.
 - E. Findings. List all relevant factual findings of the investigation.
 - F. Conclusions. List the board's conclusions as to the causes, direct and indirect, of the accident. Reports will identify whether any of the following apply:
 - i. Standards or procedures were incomplete, unclear, impractical, or did not exist.
 - ii. Standards or procedures exist but were not known or ways to achieve them were not known.
 - iii. Standards or procedures were known but were not enforced, and, if so, the reason(s) they were not enforced.
 - iv. Standards or procedures were known but were not followed, and, if so, the reason(s) they were not followed.

- G. Recommendations. For each causal factor, direct or indirect, the board will recommend actions to preclude their future occurrence. As appropriate, recommendations will target all levels of involvement, e.g., employee, supervisor, manager. The board will attach a separate implementation plan at the end of the report capturing this information and attaching timelines for implementation (along with cost estimates, if needed) for the NSF OPP Safety Officer to review. Upon full implementation of the corrective actions, an email notification shall be made to the NSF OPP Safety Officer summarizing the corrections.
 - H. Signatures (from all members of the Board).
 - I. Report abstract. This is used for lessons learned and to notify other locations of similar hazards. The abstract should contain factual information only (no interpretations, opinions, or rumors), and it should be in the following format:
 - i. Type of location.
 - ii. Date and time.
 - iii. Agent directly causing the accident.
 - iv. Personnel and equipment categories.
 - v. Details of occurrence (no names).
 - vi. Nature and number of injuries and property damage.
 - vii. Causes, direct and indirect.
 - viii. Remarks.
 - ix. Recommendations for corrective actions to preclude future occurrences of similar accidents (one for each direct and indirect cause identified above).
 - J. Appendices. The report should include photographs, sketches, diagrams and other exhibits, such as inspection reports, accident prevention programs, and training documents, as necessary to present a clear picture.
5. The NSF OPP Safety Officer shall manage what and when information is shared before the report is finalized, subject to the Freedom of Information Act and Privacy Act.

Recommendations and Findings.

The NSF OPP Safety Officer will ensure the report is thorough and addresses the below items before forwarding it to the OPP Director:

- 1. Was the true cause of the accident identified?
- 2. Were the necessary, significant engineering factors and system errors brought to light?
- 3. Was realistic corrective action recommended?

4. Has recommended corrective action been taken by the responsible personnel?
5. If the major reason/cause of the accident was human error, were the following identified?
 - A. Required safety or health standards were not clear or practical, or did not exist.
 - B. Standards exist but were not known, or ways to achieve them were not known.
 - C. Standards were known but not enforced.
 - D. Standards were known but not followed.

Instructions to Witnesses

Those who witness or immediately respond to an accident resulting in a fatality, \$100,000 or greater property damage, injuries sustained by three or more persons, should (or as otherwise directed by the senior leader on the ground):

1. Attend to the injured and notify emergency response personnel.
2. Perform necessary action required to prevent further injury or damage.
3. Do not alter accident scene. Take photos of the scene as soon as possible.
4. Immediately notify element supervisor and safety office.
5. Identify all principal witnesses.
6. Advise witnesses not to discuss the accident amongst themselves.
7. Await further instructions.

Sharing of Lessons Learned Post-Investigation

NSF OPP believes in transparency when managing accident cause and lessons-learned information and intends to provide enough information to those that have a need to know in order to address corrective actions and implementation of those actions to prevent similar type incidents. Information distribution shall be determined by NSF OPP Safety Officer who will take into account applicable privacy laws and policies and will ensure that disclosure of information is appropriate to the audience especially when sharing with other federal agencies or entities to assist them with mitigation of similar risk.

Appendix 4: Fire Prevention and Protection

Purpose

This appendix defines the policy for maintaining and administering a fire prevention and protection program. Included is guidance for all OPP facilities to develop their own site-specific plans. Each facility shall have written emergency evacuation and fire prevention plans to minimize the risks of fire and other emergencies.

Operational fire prevention and protection shall comply with 29 CFR 1910.38 and 1910.39. For construction engineering and maintenance engineering, compliance with the *IBC code version in effect at the time*. If in a location where OSHA has no jurisdiction, and compliance with a requirement is not feasible due to the environment, unavailability of equipment, or other reason, then a waiver or variance may be requested using the Authority Having Jurisdiction (AHJ) process (as described in section 6.2, above). Coordination shall be made with local emergency response units and/or fire stations when possible.

References

- 29 CFR 1910.38
- 29 CFR 1910.39
- IBC (latest version)

Policy

1. Inspections that address life safety and fire protection shall be conducted monthly for all OPP facilities. See Appendix 17 for the inspection form. In the USAP, all facilities are owned by NSF OPP and the prime contractor is obligated to ensure they are kept safe from fire risk. ASC Safety personnel shall ensure that fire hazards are corrected if local efforts are not effective. If ASC Safety cannot achieve success in correcting a fire hazard, then the NSF OPP Safety Officer shall be notified, along with the NSF OPP Antarctic facilities engineer.
2. The only building fires that should be fought by OPP participants are small, incipient fires that can be readily put out by fire extinguishers (and only if personnel are so trained), unless a trained fire brigade is available on-site.
3. Managers of facilities in remote locations shall establish, if possible and if needed, memoranda of understanding with local fire departments for fighting fires. The fire department shall be provided inventories of all hazardous material in the facility and a map showing storage locations, and fire department personnel shall be walked through the facility so they understand the layout and dangers should a fire occur.

If there is no fire department at a research station, project site, field camp or other location where serious fire hazards exist, *consideration* of a fire brigade or, at a minimum, a few personnel who are trained in the use of respirators and who can enter a building for *life saving only* shall be proposed to the OPP program manager responsible for that location's research or operational support.

4. Evacuation plans and fire prevention plans shall be reviewed annually and updated as needed.
5. Facilities that do not meet safety and fire requirements shall be expeditiously corrected. All deficiencies shall be reviewed quarterly until corrected.
6. Electrical devices and power strips shall be in compliance with any nationally recognized testing laboratory and identified as such (e.g., UL or CE).

General Building Operational and Basic Structure Requirements (Minimums)

1. In every building or structure, exits shall be so arranged and maintained as to provide free and unobstructed egress from all parts of the building or structure at all times of occupancy. No lock or fastener shall be installed to prevent free escape from the inside of any building.
2. Every exit shall be clearly visible, or the route to it shall be conspicuously marked in such a manner that every occupant of every building or structure who is physically and mentally capable will readily know the direction of escape from any point. Any doorway or passageway that is not an exit, but could possibly be thought of as an exit, shall be so arranged or marked to prevent occupant confusion with actual fire exits. Every effort shall be taken to avoid occupants mistakenly traveling into dead-end spaces during a fire.
3. Two means of egress, as a minimum, shall be provided (and maintained) in every building or structure, section, or area where the size, occupancy, and arrangement endangers occupants attempting to use a single means of egress that is blocked by fire or smoke. The two means of egress shall be arranged to minimize the possibility that both may be impassable by the same fire or emergency condition.
4. Where hazardous processes or storage are of such character as to introduce the potential for an explosion, explosion venting or an explosion suppression system specifically designed for the hazard involved shall be provided.
5. Clearance of at least 45 cm (18 inches) shall be maintained between the top of stored material and sprinkler deflectors (if present).
6. Clearance shall be maintained around lights and heating units to prevent ignition of combustible materials.

Housekeeping Requirements

1. Excess stacks of paper, crating materials, paper packing boxes, and combustibles shall be cleared from buildings daily and work areas shall be maintained free from the accumulation of combustible debris.
2. All entrances, fire exits, stairs, halls, and passageways shall allow free, unrestricted passage at all times. No material or equipment of any type shall ever be placed or stored to block or restrict free access and egress (and at no time shall space for emergency egress be less than 28 inches).
3. Combustible cleaning materials shall be stored in closed metal containers. No combustible materials shall be stored beneath or stacked within three meters (10 feet) of buildings.

4. All rags, waste, and other items soiled by flammable or combustible materials shall be placed in tight or closed metal containers for daily disposal, when a flammable locker for storage of these is not available.
5. Incinerators used must allow for no visible paper ash to escape during use. Incinerators will only be utilized by personnel who have received training and have a certificate of training on file with the employee's supervisor. PPE, such as gloves and safety glasses, will be worn when placing documents into incinerators and when removing ash with shovels. Incinerators should not be placed within 50 feet of ignition sources or buildings. The manufacturer's recommended operating instructions should be readily available to operators.

Smoking Requirements

1. Smoking is permitted only in approved locations. Smoking is prohibited inside of all OPP facilities.
2. For the purpose of this policy, smoking shall refer to the use of any of the following tobacco products:
 - A. Tobacco products: Any smoke or vapor-emitting product, including but not limited to cigarettes, cigars, cigarillos, and pipes
 - B. Non-Tobacco Products: Any smoke or vapor-emitting product or device designed or intended to simulate a tobacco product, including but not limited to e-cigarettes, but excluding gum and prescription medications.
3. Employees and visitors who wish to smoke must go outside the building to a spot at least 25 feet *downwind* from the door, unless designated smoking areas are available. The following smoking requirements shall be complied with:
 - A. Smoking is prohibited inside any vehicle or heavy equipment.
 - B. Smoking is allowed outdoors, except adjacent to building entrances and air intake ducts, and except where it presents a safety hazard, such as near fuel, explosives, and vehicle, aircraft, and small boat operations.
 - C. Smoking near building entrances may be further restricted by station management to protect workers and visitors from tobacco smoke in the workplace. General guidance is that smoking is not allowed within 25 feet of building entrances.
 - D. All materials used for smoking, including cigarette butts and matches, must be fully extinguished and disposed of in appropriate containers.
 - E. For the USAP, designated indoor smoking shelters are provided at McMurdo and South Pole Stations.
 - F. There are no indoor smoking areas at any field camp.
 - G. Smoking is prohibited in any aircraft.

Other Requirements

1. All electrical installations shall be accomplished in accordance with the current edition of the National Electrical Codes (up to one year after publication) unless the AHJ has otherwise approved a waiver. A GFCI that trips at 10mA or lower will be utilized during electrical installations.

2. **Arc Flash hazards shall be identified based on survey by a qualified and competent person and labelled accordingly on outside of panels (High Voltage).**
Arc Flash risk shall mitigated through use of LOTO (where possible) and wearing proper arc flash PPE. Only qualified and competent individuals shall be exposed to arc flash hazards.
3. All heavy equipment operation shall not get within 10 feet of an energized power line.
4. Emergency telephone numbers and reporting instructions shall be conspicuously posted.

Fire Protection

1. In accordance with International Fire Code (IFC) Section 906, portable fire extinguishers will be recharged and serviced as indicated by the manufacturer for the specific type of fire extinguisher. Record tags will be attached to all extinguishers and the dates they were inspected and weighed or recharged will be indicated thereon.
2. All participants will be trained on the proper handling and operation of fire extinguishers if they are in a high-risk fire location (e.g., laundry facility, fueling station).
3. Adequate firefighting equipment will be provided at temporary buildings and places where combustible materials are stored, as follows:
 - A. Class A fire (wood, paper, textiles, rubbish): water or foam extinguisher.
 - B. Class B fire (oil, grease, gasoline, and similar flammable materials): foam, carbon dioxide, or dry-chemical extinguishers.
 - C. Class C fire (electrical): carbon dioxide or dry-chemical extinguisher.
4. Using carbon tetrachloride or chlorobromomethane as fire extinguishing agents is prohibited.
5. Where unusual fire hazards exist or emergencies develop, additional fire-fighting facilities, such as larger portable chemical units, fire pumps, fire hoses, and outside assistance shall be developed as necessary to ensure reasonable protection.

Evacuation Plan

The emergency evacuation plan shall be posted in all high-hazard facilities and include the following:

1. Responses to alarms.
2. Notification procedures - fire department, supervisors, visitors. Include phone numbers.
3. Evacuation routes, to include designation of safe locations outside of facility where employees would wait for further instructions. If a mezzanine is present without a secondary emergency exit and a throw ladder is being utilized to escape, this must be clearly communicated and signage placed at the access point to the mezzanine identifying this as the only way to escape if the stairs become blocked due to fire.
4. Fire extinguishing activities, if required to egress safely (locations, training).
5. Emergency escape procedures and escape route assignments.

6. Procedures to account for all employees after evacuations have taken place.
7. Drill requirements, to include evacuation and rescue operations.
8. Responsible employees, such as fire marshals and coordinators, who can provide further information or explanation of duties under the plan.
9. Fire reporting procedures, accident investigation procedures.

Fire Prevention Plans

A written fire prevention plan shall be available for each high-hazard location, as identified by the fire department or other qualified person with the requisite knowledge and training. The plan shall include:

1. A list of major work-place fire hazards.
2. Storage and handling procedures for fire hazards, to include general housekeeping and procedures for the control of flammables and combustibles.
3. Potential ignition sources and control procedures, to include smoking, cutting, grinding, and welding.
4. A list of fire protection equipment and written procedures for its use.
5. Standard operating procedures (SOPs) for specific maintenance operations that present unique fire hazards, such as hot work and confined space work.
6. Names and job title of personnel responsible for maintaining fire equipment and those responsible for fire hazards.
7. Required maintenance and testing procedures -- and required frequency of maintenance and testing -- for all fire equipment and systems, e.g. CO2 systems, detectors, alarm systems.
8. Designated parking spaces for emergency vehicles and firefighting equipment.
9. A report of all fires experienced by the facility.

All employees shall be informed of the fire hazards of materials and processes to which they are exposed.

Appendix 5: Personal Protective Equipment (PPE)

Purpose and Scope

This appendix prescribes requirements, procedures, and policies for providing personal protective equipment and the apparel necessary to protect the health and safety of all personnel from occupational hazards.

References

- 29 CFR 1910, Subpart I
- ANSI (American National Standards Institute), Z87.1, (Eye and Face Protection).
- ANSI, Z41 1983, (Safety Toe Footwear).
- ANSI, Z88.2, (Respiratory Protection).
- ANSI, Z89.1, Z89.2 (Protective Headgear)

General Conditions

Personal protective equipment is the last choice for the control of workplace hazards. Engineering and administrative controls shall be initiated to reduce or eliminate the hazard before personal protective equipment is required.

When engineering and administrative controls do not eliminate or reduce the hazard, adequate protective equipment and apparel shall be provided to prevent or minimize injury or occupational disease.

Responsibilities

1. It is a supervisor responsibility to ensure that the proper PPE (e.g., hard hat, respirator, safety eyewear, protective footwear, gloves) is provided to *personnel* and worn when necessary. Supervisors or on-site managers will inform all visitors to a research station, project, field camp, or other OPP-supported site of the need to wear specific PPE in certain areas and ensure such equipment is available.
2. It is the responsibility of *personnel* to wear their personal protective equipment when required, report any damage that may have occurred to it during use, and store it as the manufacturer recommends.

Protective Eyewear Policy

All *personnel* working in eye-hazard areas are required to wear eye protection specific to the hazard encountered.

1. Supervisors are responsible for ensuring that eye-hazard operations and hazard areas are identified and that *personnel* are provided adequate PPE, to include corrective lenses if needed. (Note: NSF OPP will not pay for prescription safety glasses, since there are safety glasses and/or goggles that can be worn over prescription glasses.) Examples of eye-hazard operations are welding, grinding, abrasive blasting, using acids or corrosives, and chipping. Bright sunlight is also a hazard. Eye-hazard areas are

those areas immediately surrounding operations in which light, chemicals, projectiles, particles, or dust would be reasonably expected to cause eye damage if an unplanned event occurs.

2. Supervisors are also responsible for ensuring that all PPE and eye tests provided to *personnel* are essential for performing their work. For *personnel* who are only intermittently exposed to eye hazards, using goggles over their glasses may be a suitable alternative to the purchase of safety glasses.
3. Eye hazards and protective equipment requirements shall be reviewed with *personnel* during orientation and periodically thereafter. All personnel shall be informed of eye hazards and required to wear safety glasses or equivalent while conducting eye-hazardous operations or while in eye-hazardous areas in OPP facilities or on OPP-funded projects or research.
4. All industrial safety glasses shall meet the requirements of American National Standards Institute (ANSI) Z87.1.
5. Contact lenses are not considered appropriate substitutes for eye protection.
6. For chemical, eye-hazardous operations, emergency eyewashes shall be readily available.

Protective Footwear Policy

All *personnel* conducting foot-hazard operations or working in foot-hazard areas (extreme cold, snow, around heavy equipment) are required to wear protective footwear.

1. Supervisors are responsible for ensuring that foot-hazard areas are identified and that *personnel* have the appropriate protective footwear for the hazards associated with the specific job. Foot-hazard operations are those operations that have a high potential for foot injuries, such as snow or ice exposure, material handling, construction, or field operations.
2. Foot hazards and protective equipment requirements shall be reviewed with *personnel* during orientation and periodically thereafter.
3. All safety boots shall meet the requirements of ANSI Z41.1.
4. Waterproof boots will be considered protective footwear. If a compression hazard exists along with the hazard of excessive moisture, then the waterproof boots will be the type that have a safety toe built in.
5. Protective footwear shall be properly maintained by the *participant* while it is in the employee's possession.

Respiratory Protection

1. When respiratory protective equipment is required, a respiratory protection program shall be developed and implemented. The program shall include, but not be limited to, training, fit testing, equipment selection, maintenance, and medical surveillance, in accordance with 29 CFR 1910.134.
2. The medical status of individuals who are to wear respirators shall be evaluated and a statement from a qualified physician shall be provided that indicates the individual is qualified to wear the specified type of respirator.

3. Only approved respiratory protective devices shall be provided and used. "Approved" means that the respirator and its component parts have been tested and listed as satisfactory by the National Institute for Occupational Safety and Health (NIOSH), or applicable host nation requirements, where available.
4. A competent person knowledgeable of inhalation hazards and respiratory protective equipment shall conduct a step by step evaluation to insure only appropriate respiratory protection for the conditions of exposure (including high altitude) is utilized.

Protective Headgear

(See also Appendix 16, Helmet Policy)

1. All *personnel* shall wear hard hats when working in or visiting a hard hat area.
2. Hard hat areas shall be identified, and all points of entry to a hard hat area shall have a hard hat caution sign posted.
3. Hard hat areas shall be general areas, such as construction, alteration, or demolition sites rather than specific portions of a building or project.
4. All protective headgear shall meet the requirements of ANSI Z89 Class C, E, and/or G.
5. Protective headgear worn near electric lines and equipment shall be of the appropriate class.

Hearing Protection

1. All *personnel* that are exposed to excessive noise shall be considered for inclusion in a medical surveillance program for hearing conservation, in accordance with 29 CFR 1910.95.
2. Noise monitoring shall be coordinated by the contractor's safety office.
3. Results of the noise monitoring shall be used to determine the appropriate type of hearing protection.
4. All *personnel* working in a noise-hazardous area shall wear hearing protection.
5. Supervisors are responsible for identifying potential hazards, training *personnel* in the proper use of hearing protection, and enforcing the use of hearing protection. The need for hearing protection is suspected when any one of the following three conditions exist:
 - A. *Personnel* have difficulty communicating with each other by voice when in the presence of noise.
 - B. *Personnel* report head noises or ringing in the ears (tinnitus) after working for several hours in the noise.
 - C. *Personnel* sustain a temporary hearing loss following several hours of noise exposure, which has the effect of muffling speech and other sounds.

Miscellaneous PPE

A number of chemical, physical, and environmental hazards can be controlled with miscellaneous PPE.

- Clothing, such as coats, parkas, pants, or coveralls made of special materials designed to protect against specific or general exposures to irritant, toxic, or corrosive materials may be reusable or disposable. In most cases, protective clothing is made of special impervious materials, which can withstand repeated or prolonged contact with solvents, acids, alkalis, or other chemical or physical agents.
- Special foot protection, such as slip-on toe protectors, metatarsal protectors, hip boots, oil or chemical resistant boots, waterproof boots, or insulated boots.
- Personal flotation devices (PFDs).
- Insect bite kits, for protecting employees who are sensitive to or allergic to insect bites.
- Chaps, for protection when using chain saws.
- Safety harnesses and lanyards for fall protection.
- Insect repellent in areas infested with chiggers, mosquitoes, and ticks.

Appendix 6: Confined Space Entry Procedures

Purpose

This appendix contains requirements for practices and procedures to protect personnel from the hazards associated with entry into permitted confined spaces.

Scope

This appendix applies to all operations and research activities performed under OPP auspices.

References

- 29 CFR 1910.146
- DHHS (NIOSH) Publication No. 87-113; "A Guide to Safety in Confined Spaces"
<http://www.cdc.gov/niosh/docs/87-113/default.html>

Definitions

Acceptable entry conditions: The conditions that must exist in a permit space to allow safe entry by personnel.

Attendant: The individual stationed outside a permit space who monitors the authorized entrants and performs assigned duties.

Authorized entrant: Person who is authorized to enter a permit space.

Confined space: A space that:

- is large enough and so configured that an employee can bodily enter and perform work;
- has limited or restricted means of entry and exit; and
- is not designed for continuous employee occupancy.

Entry: The action by which an employee passes through an opening into a permit-required confined space. Entry is assumed to be as soon as the employee's body breaks the plane of the opening.

Entry permit: The written document that is provided to allow and control entry into a permit-required confined space.

Entry supervisor: The person responsible for determining acceptable conditions prior to entry into a permit-required confined space and for terminating entry.

Designated official: The person responsible for evaluating permit-required confined spaces and ensuring program elements are enforced.

Hazardous atmosphere: An atmosphere that may expose employees to risk of death or injury from one or more of the following causes:

- Flammable gases or vapors in excess of 10 percent of the lower flammable limit (LFL).
- Airborne combustible dust in concentration equal to or greater than its LFL.

- Atmospheric oxygen less than 19.5% or greater than 23.5%.
- Atmospheric concentration of any substance that has a permissible exposure limit (PEL).
- Any other atmospheric condition that is immediately dangerous to life and health.

Non-permit confined space: A confined space that does not contain or, with respect to atmospheric hazards, does not have the potential to contain any hazard capable of causing death or serious physical harm.

Permit-required confined space: A confined space that has one or more of the following characteristics:

- It contains or has the potential to contain a hazardous atmosphere.
- It contains a material that has the potential to engulf an entrant.
- It has an internal configuration by which an entrant could be trapped or asphyxiated by inwardly converging walls or by a floor that slopes downward and tapers to a small cross-section.
- It contains any other recognized serious safety or health hazard.

Permit system: The written procedures for preparing and issuing permits for entry and for returning the permit space to service upon termination of entry.

Rescue service: The personnel designated to perform rescue functions in permit-required spaces.

Retrieval system: The equipment used for non-entry rescue of a person from permit-required spaces.

Testing: The process by which hazards are identified and evaluated for entry into permit-required spaces.

General Requirements

1. At each activity, personnel shall evaluate, or designate a competent person to evaluate, whether there is a potential for permit-required confined spaces.
2. The evaluation shall use the definitions presented above to determine the presence of confined spaces.
3. A list of confined spaces (both permit-required and non-permit-required) shall be maintained on site.
4. All permit-required confined spaces shall be identified with a sign to inform personnel of the existence, location of, and danger posed by the permit-required confined space. The sign will be written in English and the host nation language and will read as follows:

Responsibilities

Authorized Entrants

Authorized entrants shall:

1. Communicate with the attendant as necessary so the attendant can monitor entrant status and alert entrants of any need to re-evaluate the permit-required confined space.
2. Evacuate the permit-required confined space and alert the attendant whenever they recognize any warning signs or symptoms of exposure to a dangerous situation, or if they detect a prohibited condition, or whenever the attendant or entry supervisor orders evacuation, or whenever an evacuation alarm is activated.

Attendants

Attendants shall:

1. Remain outside the permit-required confined space during entry operations until relieved by another attendant.
2. Take action when conditions warrant evacuation of the permit-required confined space, inform the entry supervisor of conditions, and warn persons approaching the permit-required confined space.
3. Maintain an accurate list of personnel within the permit-required confined space and a means to identify the personnel.
4. Communicate with entrants as necessary to monitor them and alert them of the need to evacuate.
5. Immediately order evacuation of the permit-required confined space if conditions change to pose a hazardous condition.
6. Perform non-entry rescue as specified in the permit and summon rescue or other emergency services as necessary.
7. Not perform any other duty other than that of attendant during permit-required confined space entry.

Entry supervisors

Entry supervisors shall:

1. Verify that all tests specified by the permit have been conducted and that all necessary equipment and procedures are in place before entry.
2. Terminate the entry when assigned work is completed or when conditions warrant evacuation.
3. Verify that rescue services are available and that means of summoning them are operable.
4. Ensure that entry operations are consistent with the terms of the entry permit and that acceptable conditions are maintained.

Permit-Required Confined Space Entry Procedures

1. The designated official shall develop and implement a system for preparing, issuing, and canceling permit-required confined space entry permits. At a minimum, these permits must have the information listed in the sample permit in Appendix 17, in whatever format is desired. Additional information may be included if necessary or desired.
 - A. Before entry begins, the entry supervisor identified on the permit shall sign the permit to authorize entry.
 - B. The completed permit shall be posted at the entry portal so that entrants can confirm the pre-entry preparations have been completed.
 - C. The permits shall be kept in a log book on-site for review by OPP.
 - D. The duration of the permit shall not exceed the time required to complete the task identified on the permit.
2. Plans and procedures shall be developed for summoning rescue personnel and for preventing unauthorized personnel from attempting a rescue.
3. The entry supervisor shall designate at least one attendant who will remain outside the permit-required confined space for the duration of the activity.
4. The designated official shall develop procedures to ensure that when more than one crew is authorized entry, the activities of one crew will not interfere with the work of the other crew.
5. The designated official shall review the entry program periodically to ensure the measures contained in the program are still adequate.

Training Requirements

1. All employees shall be instructed not to enter permit-required confined spaces without the proper permit that describes procedures and practices for the space.
2. Employees who are required to enter permit-required confined spaces or act as attendant or entry supervisor shall be trained in the knowledge and skills necessary for the safe performance of their work. The employees must also be familiar with the hazards associated with the entry and the measures used to ensure safe conditions.
3. Training shall conform to the requirements of the references above.
4. All training shall be certified by the instructor upon successful completion by participants.
5. Evidence of training shall be available onsite where the entry is occurring for government review if needed.

On-Site Rescue Teams

1. Each member of the rescue team shall be trained in the use of personal protective equipment and other equipment necessary to perform a rescue.
2. Each member of the rescue team shall practice making a rescue at least once every 12 months. The practice drill shall simulate actual conditions within the permit-required confined space.

3. Each member of the rescue team shall receive the same level of training as authorized entrants and shall be trained in basic first aid and cardiopulmonary resuscitation (CPR).

Off-Site Rescue and Emergency Services

1. To ensure availability in case of need, contact must be made with emergency services before entry into a permit-required confined space. If there are no emergency services, a rescue team must be established and trained in permit-required confined space rescue procedures, with all necessary emergency equipment.
2. The rescue service shall be informed of the associated hazards that may be present during a rescue.
3. A rescue team shall be provided access to all permit-required confined spaces for which rescue may be necessary so the service can develop appropriate plans. The team shall be trained in permit-required confined space rescue procedures, with all necessary emergency equipment at the work site.

Retrieval Systems

1. Each authorized entrant shall use a chest or full body harness, with a retrieval line attached at the center of the entrant's back near the shoulder level or above the entrant's head.
2. Retrieval lines shall be attached to a mechanical device or fixed point outside the permit space in such a manner that rescue can begin as soon as the rescuer becomes aware of the need for rescue.
3. A mechanical device shall be available to retrieve personnel from vertical permit-required confined spaces more than 1.5 meters (5 feet) deep.

Recordkeeping

Records shall be maintained at each facility by the supervisor documenting the training. Records shall include safety drills, inspections, tests and maintenance, and any atmospheric tests made, to include time, date, atmospheric concentrations of substances for which there is a permissible exposure limit, PPE used, and employees' names.

Sample Activity Hazard Analysis, Confined Space Entry

Listed below are hazards associated with entering a confined space and possible means of controlling those hazards.

Hazard: Toxicity

Causes:

- *Toxic levels of substances in confined space*
- *Decomposition of organic material in confined space*
- *Toxic mixture of substances in confined space*
- *Substances being used in confined space, e.g., cleaning solvents*
- *Residual vapors from previous contents of confined space*

- *Welding fumes or vapors*

Controls:

- *Evaluate previous history of the confined space to avoid reactions with residual chemicals, wall scale, and/or sludge, which can be highly reactive.*
- *Check for compatibility of materials when structural members and/or equipment are introduced e.g., aluminum ladder, cleaning solvents.*
- *Utilize proper respiratory equipment based on air monitoring.*

Hazard: Insufficient Oxygen

Causes:

- *Rust*
- *Use of other gases, e.g., nitrogen, carbon dioxide.*
- *Welding*

Controls:

- *Maintain atmospheric oxygen level of 21% by volume through ventilation and/or exhaust.*
- *Provide and maintain adequate ventilation and exhaust, as per specific conditions in the confined space.*
- *Self-contained breathing apparatus.*

Hazard: Explosion/Fire in Confined Space

Causes:

- *Combination of combustible gases and a spark from activity of an employee in confined space (dip testing tank, welding, electric tools, light bulbs, matches).*

Controls:

- *No matches, lighters, or other flame-producing sources allowed in confined space.*
- *Explosion proof bulbs.*
- *Provide adequate ventilation to prevent an enriched oxygen atmosphere or to eliminate the explosive or flammable atmosphere.*

Hazard: Explosion/Fire at Point of Entry.

Causes:

- *Employee welding, using power tool, or engaging in other spark-generating activity at point of entry.*
- *Driving automobile near confined space containing combustible materials.*

Controls:

- *Use non-sparking tools.*
- *Barricade entry point at a reasonable distance.*

- *Prohibit vehicles within immediate area.*

Hazard: Electrocution/Electric Shock

Cause:

- *Conductive walls of confined space picking up an electrically "hot" source in confined space.*

Control:

- *Ensure all electrical apparatus used comply with National Electrical Code (NEC) standards.*
- *Lock out electric sources.*

Hazard: Caught In/Crushing

Cause:

- *Entering a machine or area that has not been locked out, then having it activated.*

Control:

- *Manually isolating each piece of equipment before workers enter or while they work in a confined space (Locking out).*
- *Follow specific procedures for mechanical lockout.*

Hazard: Struck by Falling Objects in Confined Space

Cause:

- *Falling objects from walls of confined space.*
- *Objects falling through point of entry.*

Control:

- *Barricade entry of confined space.*
- *Wear appropriate personal protective equipment, i.e., hard-hat.*
- *Assess hazards before entry.*

Hazard: Falls While in Confined Space

Causes:

- *Wet, oily floors*
- *Configuration of internal surfaces.*
- *Holes/breaking through part of confined space.*
- *Falls over object or /tools.*
- *Poor lighting.*
- *Uneven surfaces.*

Controls:

- *Ensure floor or base is clean and dry.*

- *Wear proper foot protection.*
- *Locate, identify, and barricade existing holes*
- *Provide adequate illumination.*
- *Practice good work habits (housekeeping).*
- *Use guardrails and scaffolding properly.*

Hazard: Bodily Reactions, Strains, Abrasions

Causes:

- *Entering or leaving a cramped, sharp edged, high-level, or hazardous point of entry to a confined space.*
- *Maneuvering within a confined space.*
- *Low head room/striking head.*

Controls:

- *Wear personal protective equipment.*
- *Training to ensure awareness.*
- *Reduce "bulkiness" of clothing and equipment.*
- *Engineering controls to eliminate condition.*

Hazard: Eye Injuries

Causes:

- *Falling dust*
- *Grinding, chipping, other operations that cause flying debris.*

Control:

- *Wear proper eye protection at all times.*

Hazard: Contact with Temperature Extremes

Causes:

- *Steam discharge*
- *Welding surfaces*
- *Weather conditions*
- *Compressed gases, e.g., nitrogen.*

Controls:

- *Wear appropriate clothing and PPE.*
- *Limit time of exposure.*
- *Know symptoms of excessive exposure.*
- *Frequent breaks to ensure high fluid intake to compensate for hot climates and for hot conditions inside PPE.*

Appendix 7: Hazardous Energy Control (Lockout/Tag-Out)

Purpose

This appendix defines the minimum requirements for establishing a program and utilizing procedures for affixing the appropriate lockout or tag-out device to energy isolating devices and to otherwise disable machines or equipment to prevent unexpected energizing, start-up, or release of stored energy, in order to prevent injuries to personnel.

Applicability

This appendix applies to the control of energy during servicing and/or maintenance of equipment. This includes contractors performing renovation, remodeling, demolition, O&M, and construction activities.

References

- 29 CFR 1910.147

Definitions

Energy isolating device: A mechanical device that physically prevents the transmission or release of energy.

Energy source: Any source of electrical, mechanical, hydraulic, pneumatic, chemical, thermal, or other energy.

Lockout: The placement of a lockout device on an energy isolating device, in accordance with an established procedure, ensuring that the energy isolating device and the equipment being controlled cannot be operated until the lockout device is removed.

Lockout device: A device that utilizes a positive means, such as a lock (key or combination) to hold an energy isolating device in a safe position and prevent the energizing of equipment.

Tag-out: The placement of a tag-out device on an energy isolating device, in accordance with an established procedure, to indicate that the energy isolating device and the equipment being controlled may not be operated until the tag-out device is removed.

Tag-out device: A prominent warning device, such as a tag and a means of attachment, which can be securely fastened to an energy isolating device in accordance with an established procedure, to indicate that the energy isolating device and equipment being controlled may not be operated until the tag-out device is removed.

Zero-energy state: This means no energy is coming into or is inside the equipment. Equipment that is just turned off is not at a zero-energy state because it could easily be turned on again. Isolating the energy source and using locks and tags ensures the equipment reaches and stays at a zero-energy state.

General Requirements

Lockout/Tag-Out Requirements

1. If an energy isolating device is not capable of being locked out, the energy control program shall utilize a tag-out system.
2. If an energy isolating device is capable of being locked out, the energy control program shall utilize lockout, unless it can be demonstrated that the use of a tag-out system will provide a level of safety equivalent to that obtained by using a lockout system.
3. As of January 2, 1990, whenever replacement, major repair, renovation, or modification of equipment is performed, and whenever new equipment is installed, energy isolating devices for such equipment shall be designed to accept a lockout device.

Equipment Power Requirements

Before any piece of equipment can be serviced or worked on in any way, it must be in a zero energy state.

Equipment may be powered by different types and/or combinations of energy sources, such as:

- Electrical energy (the flow of currents through wires and circuits)
- Hydraulic energy (any type of liquid, including water, under pressure)
- Pneumatic energy (gas, including air, under pressure)
- Mechanical energy (potential or "built-up" energy, such as spring energy, that may cause equipment parts to move without warning)

Protective Material and Hardware Requirements

1. Locks, tags, chains, wedges, key blocks, adapter pins, self-locking fasteners, or other hardware shall be provided for isolating, securing, or blocking equipment from energy sources.
2. Lockout and tag-out devices shall be singularly identified, shall be the only devices used for controlling energy, shall not be used for other purposes, and shall meet the following requirements:
 - A. Lockout devices and tag-out devices shall be capable of withstanding the environment to which they are exposed for the maximum period of time that exposure is expected.
 - B. Tag-out devices shall be constructed and printed so that exposure to weather conditions or wet and damp locations will not cause the tag to deteriorate or the message on the tag to become illegible.
 - C. Tags shall not deteriorate when used in corrosive environments, such as areas where acid and alkali chemicals are handled and stored.

3. Lockout and tag-out devices shall be standardized within the facility according to at least one of the following criteria: color, shape, or size. Additionally, tag-out devices should be standardized in print and format.
4. Lockout and tag-out devices shall be substantial:
 - A. Lockout devices shall be substantial enough to prevent their removal without the use of excessive force or unusual techniques, such as with the use of bolt cutters or other metal cutting tools.
 - B. Tag-out devices, including their means of attachment, shall be substantial enough to prevent inadvertent or accidental removal.
5. Lockout and tag-out devices shall be identifiable:
 - A. Lockout and tag-out devices shall indicate the identity of employee applying the device.
 - B. Tag-out devices shall warn against the hazardous condition if the machine or equipment is energized, and they shall include a legend, such as the following:
6. No lockout or tag-out device shall be removed by anyone other than the individual who placed it.

Inspection Requirements

1. A qualified individual shall conduct an inspection of the energy control procedures at least annually to ensure that established procedures and requirements are being followed.
2. Periodic inspections shall be performed by an authorized person other than the one(s) utilizing the energy control procedures being inspected.
3. Periodic inspections shall be conducted to correct any deviations or inadequacies identified.
4. Periodic inspections shall include a review between the inspector and each authorized and affected employee regarding the procedures and responsibilities being used.
5. Periodic inspections will be documented for each piece of machinery or equipment. This certification shall identify the machine or equipment on which the energy control procedure was being used, the date of the inspection, the employees included in the inspection, and the person performing inspection.

Responsibilities

Supervisors will establish programs and utilize procedures (lockout/tag-out) for controlling hazardous energy for their facilities. Supervisors will also ensure that all necessary personnel receive required training regarding the control of hazardous energy.

Training

Employers shall provide training to ensure that the knowledge and skills required for the safe application, use, and removal of energy controls are acquired by employees.

1. All authorized employees will receive initial and periodic (annual) training in the recognition of hazardous energy sources, the types and magnitude of the energy present in the workplace, and the methods and means necessary for energy isolation and control.
2. All affected employees shall be instructed in the purpose and use of the energy control procedures.
3. All other employees whose work operations are or may be in an area where energy control procedures may be used shall be instructed about the procedure and about the prohibition against attempting to restart or re-energize machines or equipment that are locked out or tagged out. This training may be accomplished during regularly scheduled safety meetings.
4. Employees shall be made aware that lockout or tag-out are to be performed only by the authorized employees performing the servicing or maintenance.
5. Training will be documented. Certification shall contain each employee's name, dates of training, name of person(s) conducted the training, where the training was performed, and the subjects covered.

Personal Protection Equipment

All appropriate personnel protective equipment will be used when applying lockout and tag-out procedures.

Appendix 8: Respirator Program Guidelines

Purpose

The purpose of this appendix is to prescribe requirements and procedures for selecting, using, and maintaining respirators.

Applicability

This appendix applies to all employees who may wear a respirator. Contractors are required to submit a standard operating procedure (SOP) on the proper selection, use, maintenance, and disposal of respirators.

References

- 29 CFR 1910.134, OSHA Standard for Respiratory Protection
- ANSI Z88.2, Practice for Respiratory Protection

Policy

It has long been recognized that the respiratory tract is the most important route by which toxic substances enter the body. Most industrial poisonings are caused by inhaling toxic substances. The primary effort to control such hazards should be in the form of engineering controls, such as specially designed ventilation systems. If engineering controls cannot be implemented, or are cost prohibitive, infeasible, or inadequate, respirators must be used to protect the individual whenever hazardous conditions exist. A respiratory protection program shall be established and implemented in accordance with ANSI Z88.2. This program shall encompass training, maintenance, and awareness of the limitations associated with various types of respirators.

Responsibilities

All Personnel

All personnel who might wear a respirator shall become familiar with the respiratory protection program, as outlined in this appendix. A copy of the program shall be maintained in the local safety office.

Supervisors

All supervisors shall:

- Request assistance from the contractor's safety office in conducting atmospheric testing of the work area to determine if employees are exposed to contaminant levels in excess of the threshold limit values (TLV) and permissible exposure limits (PEL).
- Request assistance from the contractor's safety office for respirator fit-testing.
- Enforce the use of respirators by employees. Written documentation of an employee's failure to wear respirators shall be cause for disciplinary action and

shall be forwarded to the safety office for inclusion in the employee's medical records.

- Ensure all employees are trained in the proper use of respirators and report to their medical surveillance examinations.

Employees

All employees shall:

- Wear and maintain respirators as required.
- Notify supervisors of any problems with respirators, or if they are having respiratory problems.
- Report for training and medical surveillance examinations.

Contractor's Safety Office

The contractor's safety office shall:

- Ensure all respirators are approved by the National Institute for Occupational Safety and Health (NIOSH) or meet host nation requirements for local national employees.
- Provide oversight to ensure compliance with the respiratory protection program.

Program Requirements

1. Respirators and canisters shall be selected according to the hazards to which the worker is exposed. Accordingly, project personnel must know which type of respirator or canister to use in each particular situation.
2. Supervisors shall be instructed in the proper use of respirators and their limitations (e.g., respirators designed for protection against one hazard may be ineffective against another).
3. Employees shall ensure respirators are regularly cleaned, disinfected, and stored in a convenient, clean, and sanitary location.
4. Employees shall be trained in the care of their respirator. Training shall include inspection for defects, cleaning and disinfection, repair, and storage.
5. Supervisors shall not assign personnel to tasks requiring the use of respirators unless it has been determined that they are medically able to wear respirators while performing their work (see "Medical Requirements" below).

Training Requirements and Respirator Use

1. Supervisors as well as employees must know which respirators and cartridges are to be used in each situation. There must be written procedures in place that describe this. When new operations or projects develop, supervisors should contact the local safety office for assistance, as necessary.
2. An additional person must be present in areas where the failure of a respirator could result in the wearer being overcome by a toxic or an oxygen-deficient atmosphere.

- Effective communications (visual, voice, or signal line) will be maintained between both (or all) individuals present.
- Supervisors shall ensure that their employees have an opportunity to handle the respirator, have it fitted properly, test its seal, and familiarize themselves with the respirator by wearing it at periodic training sessions.
 - It must be stressed that respirators shall not be worn when a good fit cannot be achieved. A good fit cannot be achieved by anyone who has a beard, long sideburns, a long mustache, or stubble. Also, the absence of dentures can affect the fit of a face piece.
 - If air-line respirators are used, the supplied air source shall be inexhaustible and the hose length cannot exceed 300 feet from the source to the user.
 - The wearer of any type of respirator shall not be allowed to wear contact lenses. If a spectacle, goggle, face shield, or welding helmet must be worn with a face piece, it shall be worn so as not to adversely affect the seal of the face piece to the face.

Maintenance, Care, and Storage

- Each respirator shall be inspected by the employee for defects before and after each use, and at least monthly, to assure it is in good working order. The inspections shall include a check of the tightness of the connections and a check of the face piece, valves, connecting tube, and cartridge. All rubber and elastic parts must be inspected for pliability and signs of deterioration.
- Each self-contained breathing apparatus shall be inspected by the employee monthly. Air cylinders shall be fully charged, according to the manufacturer's instructions.
- If respirators are used regularly, they may be assigned to individual workers for their exclusive use.
- Respirators shall be regularly cleaned and disinfected. Those issued for the exclusive use of one worker shall be cleaned after each day's use. Those used by more than one person shall be thoroughly cleaned and disinfected after each use. To clean and disinfect respirators, they should be washed with detergent in warm water using a soft brush, rinsed thoroughly in clean water, rinsed in a disinfectant solution, rinsed again in clean water (to prevent skin irritation), and air dried in a clean place. Cleaner and sanitizer solutions that clean effectively and contain bactericide are also available.
- After inspection, cleaning, and necessary repair, respirators shall be stored in sanitary locations to protect against dust, sunlight, heat, extreme cold, excessive moisture, and damaging chemicals. It is useful to store non-emergency respirators in plastic bags after they have been cleaned and disinfected.
- Defective respirators shall be tagged and removed from service by the supervisor.
- Respirators shall not be stored in tool boxes and lockers unless they are in carrying cases or other protective containers.
- When stored, the face piece and exhalation valve must be in an upright or resting position. If stored in a bent, folded, or abnormal position, the face piece and exhalation valve can warp or become deformed and thereby void the NIOSH approval.

Identification of Respirators and Cartridges

Most manufacturers use the following guidelines when designing their product. Therefore, while the identification information given below is necessary to know, it is usually not of major significance to the purchaser. Assistance in ordering specific respirator equipment may be obtained from the local safety office.

1. The primary means of identifying respirator cartridges should be via properly worded labels. Each cartridge shall have bold letters stating "Cartridge for (name of contaminant)." It shall also state "For respiratory protection in atmospheres containing not more than [X] percent by volume of (name of contaminant)."
2. Each cartridge shall have a label warning that gas masks should be used only in atmospheres with enough oxygen to support life (at least 16 percent by volume), since the cartridges are only intended to neutralize or remove contaminants from the air.
3. Each cartridge shall be painted a distinctive color for a particular contaminant. For example, an organic vapor cartridge is signified by the color black. A cartridge for use in ammonia gas atmospheres (limited to 300 ppm) is green.
4. The use of one manufacturer's cartridge with another manufacturer's respirator is unacceptable. The problem with interchanging brand names is that an airtight seal cannot be guaranteed. In addition, the interchanging of respirator components voids any approval granted by NIOSH.

Medical Requirements

It is important that no employee be assigned to tasks requiring the use of respirators if, based upon their most recent medical examination, the examining physician determines the employee will be unable to function normally while wearing a respirator, or if the safety and health of the employee or other employees will be impaired by his or her use of a respirator. The focus of the medical examination should be on pulmonary and cardiovascular fitness.

Workers who have indications of coronary artery disease, myocardial infarction, angina pectoris, or progressive or severe hypertension should only wear a continuous-flow, air-line respirator, unless approval from their physicians is obtained.

Those whose duty it is to respond to emergencies should not wear any type of respirator if they have a cardiovascular deficiency. Other physical conditions, such as diabetes or grand mal epilepsy, may limit respirator use. The final decision regarding respirator use for any individual is the responsibility of the examining physician.

Guide for Selecting Respirators

The contractor's safety office is responsible for advising supervisors on the type of respirator required. In selecting a respirator, safety and supervisory personnel should assemble the information needed by answering the following questions:

1. What is the measured or estimated contaminant concentration at the breathing zone of the worker?
2. What is the PEL and/or TLV of the contaminant? (Use the more stringent of the two.)
3. Is the workspace oxygen deficient (less than 19.5% oxygen)?

4. What is the lower explosive limit (LEL) of the contaminant?
5. Does an IDLH situation exist at contaminant concentration?
6. If the contaminant is a gas or vapor, is efficient sorbent available and is there adequate warning containing the contaminants dangers?
7. Will eye irritation occur at contaminant concentration?
8. Will skin absorption pose a problem?
9. Are there other circumstances or conditions that should be considered?

Appendix 9: Hearing Conservation

Purpose

The purpose of this appendix is to eliminate occupational, noise-related hearing loss among personnel.

Applicability

This appendix applies to all personnel who may be exposed to noise greater than OSHA's PELs. The provisions of this appendix do not apply to deaf personnel, as defined in ANSI S3.20.

References

- 29 CFR 1910.95, OSHA, Occupational Noise Exposure
- 29 CFR 1926.52, OSHA, Occupational Noise Exposure

Background

Noise is unwanted sound transmitted, primarily, to the ear through air. It may injure the hearing mechanism. Noise-induced hearing loss may be temporary or permanent, depending on the frequency and intensity of the noise and the duration of exposure. Temporary hearing loss or temporary threshold shift results from auditory fatigue induced by exposure to *intensive sound with a return* of the individual's pre exposure hearing level after a period of time away from intensive sound. Permanent hearing loss or permanent threshold shift results from damage to the end organ of the inner ear and it is not reversible by any known treatment.

Requirements

Supervisors are responsible for becoming familiar and implementing the requirements established in this appendix. They are responsible for identifying those areas where employees are exposed to high noise levels, posting notices in noise hazardous areas, using engineering controls, and educating employees on preventing hearing loss and the use of personal protective equipment (PPE). Noise hazards will be included in the position hazard analysis.

Supervisors shall notify the contractor's safety office of suspected noise hazardous areas. The local safety office shall then coordinate noise surveys to determine the level of exposure. In areas where employees are subjected to continuous noise levels of 85 dBA or impulse levels of 140 dBA, regardless of duration, engineering and administrative controls (such as limiting the duration of exposure) will be implemented to reduce the noise hazard. In noise hazardous areas where engineering and administrative controls are not feasible, any employee exposed to 85 dBA or greater shall be provided hearing protection devices and will be entered in the medical surveillance program. Nobody should be exposed to impulse or impact noise above 140 dBA peak sound pressure level.

Responsibilities

Supervisors

Supervisors shall:

- Request that the contractor's safety office measure and analyze all areas and equipment suspected of being noise hazardous. An area where one has to shout to communicate is probably over 85 dBA.
- Post signs or sticker labels on equipment or areas where noise is a hazard.
- Enforce the use of hearing-protective equipment.
- Include noise exposure in employees' activity hazard analyses (AHAs).
- Ensure engineering controls are established to protect employees from noise hazards.
- Requisition hearing protection equipment that reduces ambient noise level to no more than 85 dBA at the wearer's ear.
- Ensure that only hearing-protective devices that meet requirements established by ANSI S3.19, are issued to employees exposed to noise-hazard areas.
- Ensure that the applicable job description contains the requirement that the employee must wear hearing protection in the performance of the job.
- Use disciplinary actions when necessary to enforce the proper use of hearing protection.
- Ensure that employees receive orientation and ongoing training on hearing conservation during safety meetings.
- Ensure that employees exposed to a noise-hazard work environment are considered for inclusion in the hearing conservation program.

Employees

Employees shall:

- Wear the provided and proper hearing protection, when required.
- Report for audiometric testing when required.
- Attend and participate in periodic safety and occupational health training.

Contractor's Safety and Occupational Health Office

The contractor's safety and occupational health office shall:

- Ensure that only calibrated equipment is used for measuring and analyzing noise.
- Notify supervisors of areas or equipment that produce hazardous noise.
- Maintain all noise survey records for 40 years.
- Make provisions to schedule personnel for audiometric testing and yearly follow-up hearing tests for all personnel included in the hearing conservation program (i.e., those who will potentially be exposed to 85 dBA for more than eight hours per day).

Occupational Health Nurses/Medical Testing Facility

Occupational health nurses and/or the medical testing facility shall:

- Ensure audiometric testing is conducted by a physician, audiologist, otolaryngologist, or a certified technician under the supervision of one of the listed professionals.
- Ensure that the audiometric testing is conducted in an environment that allows 0 dBA hearing levels at test frequencies of 500, 1000, 2000, 3000, 4000, and 6000 Hz. Testing shall also include pure tone, air-conductive hearing threshold levels in each ear, with test frequencies of at least 500, 1000, 2000, 3000, 4000, and 6000 Hz.
- Notify employees of any validated standard threshold shift (STS) in hearing loss
- Maintain a roster of all personnel included in the hearing conservation program.

Appendix 10: Hazard Communication Program

Purpose

The purpose of this appendix is to establish a formal hazard communication program to inform and educate personnel on the occupational health hazards associated with the chemicals in their workplace.

Applicability

This appendix is applicable to all personnel who are performing work or research within OPP funded and/or supported locations.

References

- 29 CFR 1910.1200
- 29 CFR 1926.59

General

The hazard communication program has been developed, in accordance with 29 CFR 1910.1200, to ensure that all chemical substances that are brought into the workplace have been evaluated for their physical and health hazards. Information concerning these hazards must be transmitted to those employees with potential exposure. Examples of such exposure would be employees subjected to the hazardous chemical in the course of employment, through any route of entry (inhalation, ingestion, and skin contact, or absorption), under normal conditions of use or in an emergency. Note that only those chemicals that have been classified as health or physical hazards, in accordance with 29 CFR 1910.1200, are required to be included in the hazard communication program. Employees should consult with the contractor's safety office if there is an uncertainty as to a chemical's inclusion.

Major Elements

There are five major elements of the hazard communication program; 1) written hazard communication program; 2) chemical assessment and inventory; 3) hazardous chemical labeling system; 4) safety data sheets (SDSs); and 5) employee training. This appendix of the OPP SOH policy constitutes the written hazard communications program. The remaining elements are discussed below.

Chemical Hazard Assessment and Inventory

Every chemical funded by OPP (directly or indirectly) will be assessed for its chemical or physical hazards. Where applicable, substitute chemicals that are less hazardous shall be purchased for the assigned tasks. Chemical manufacturers or importers are required, by federal and international laws, to determine if the chemicals they sell or import are hazardous, and to provide this information via label, SDS, mark, or tag to the purchaser. Based on this information, the chemicals purchased shall be included in the hazardous chemicals and materials inventory, and the inventory will be continually updated.

As hazardous chemicals are purchased, they will be added to the inventory. As hazardous chemicals are disposed of, they will be removed from the list. However, data on their hazards will be maintained by the relevant supervisor and the contractor's safety office. Industrial hygiene and workplace inspections will include a check to ensure the accuracy of the inventory.

Hazardous Chemical Labeling System

Chemical manufacturers, importers, and distributors are required by federal and international laws to label, mark, or tag each container of hazardous chemicals leaving their workplace with:

- the identity of the hazardous chemical(s) contained within;
- an appropriate hazard warning label; and
- the name, address, and telephone number of the chemical manufacturer or importer or other source that can provide additional information on the hazardous chemical(s) and appropriate emergency procedures.

Supervisors shall ensure that each container of hazardous chemicals in the workplace is labeled, tagged, or marked accordingly and that the label or other form of warning is legible, in English and in the host nation language, and is prominently displayed on the container. Supervisors shall also ensure the information is readily available during each work shift.

For the purpose of this requirement, container means any bag, barrel, bottle, box, can, cylinder, drum, storage tank, or similar enclosure that contains a hazardous chemical. Pipes and piping systems are not considered to be containers. However, pipe and piping systems will be labeled as specified above if substances that are transported within them are or will be contained in the hazardous material inventory.

Portable containers into which hazardous chemicals are transferred shall be marked to indicate the chemical, hazardous or non-hazardous, which they contain. Containers that both contain and process chemicals may have signs, placards, process sheets, batch tickets, operating procedures, or other such forms of identity to ensure employees are aware of the hazards involved with the chemical or process.

Safety Data Sheets (SDS)

Federal law 29 CFR 1910, requires chemical manufacturers and importers to obtain or develop a Safety Data Sheet for each hazardous chemical they produce or import and employers to maintain a SDS for each hazardous chemical they procure and use. The inclusion of Federal Acquisition Regulation (FAR) clause 52.223-3 in purchase orders for chemical products will ensure that the manufacturer or distributor provides SDSs for those products. The contractor's procurement office will ensure that every purchase order will include FAR clause 52.223-3.

SDSs may take various forms (including operating procedures), and they may be designed to cover groups of hazardous chemicals if it is appropriate to address the hazard of the process rather than the individual chemicals. In these circumstances, the information contained in the SDS must be provided for each chemical in the process and be readily accessible during each work shift to all affected personnel.

When work center personnel receive a SDS, they shall forward a copy to the contractor's safety office and ensure the SDS is readily accessible to personnel in the work area, in a language understood by each worker. The new chemical will be included in the hazardous material inventory and added to the work area inventory. Information on the SDS will be used by the safety office to develop adequate hazard control and abatement procedures and establish training requirements for personnel exposed to the chemical.

Employee Information and Training

Supervisors are responsible for providing their personnel with an orientation on the purpose and requirements of this program, and specific training on hazardous chemicals in their workplace. This training will be conducted during the first four weeks of a new employee's assignment, when a new chemical is introduced in the workplace, or whenever the need exists. Specific training shall include, as a minimum:

- a description of those operations in the employee's work area where hazardous chemicals are present and in use;
- a chemical hazard evaluation. This will include a listing of those chemicals included in the hazardous material inventory for the work area, the work area labeling system, and the use of safety data sheets. Training in the use of the safety data sheets shall include the physical and chemical hazards of the chemical and the specific measures required to protect the employee from these hazards; and
- methods and observations that may be used to detect the presence or release of a hazardous chemical within the work area.

The supervisor will contact the contractor's safety office within the first four weeks of the new employee's assignment to schedule formal training for the employee in hazard communication. The training will be provided during the next site visit to the area.

Non-Routine Tasks

Before undertaking a non-routine task, supervisors shall inform employees of any hazards associated with the non-routine work they have been assigned. Generally, these hazards will have been pre-determined and brought to the supervisor's attention.

If the hazards have not been pre-determined, the supervisor will notify the safety office and request a hazard evaluation. The employee will then be informed of the associated hazards.

Hazard Communication for Contract Activities

All design plans and specifications for structures or activities will list any hazardous substances and materials incorporated in the design, including those used in the construction of the structure or performance of the activity. This list will serve as the primary notice to contractors of the hazardous materials and substances to which their employees may be exposed to while performing their work. It is also required that the contractor provide documentation of employee training in hazardous substances and chemicals used on every job site. It is required that the contractor develop an activity hazard analysis acceptable to the COR that identifies those hazards, including chemical hazards, anticipated during a particular phase of work, and proposes methods to control those hazards. Contractors shall utilize those sections of the activity hazard analysis and applicable SDSs to provide training to their employees.

Appendix 11: Report of Hazard, Unsafe Condition, or Unsafe Practice

Purpose

The purpose of this appendix is to provide all personnel with a practical means of reporting hazards, unsafe conditions, or unsafe practices encountered while on the job.

Applicability

All personnel working on OPP-funded activities.

General Requirements

If a hazard, unsafe condition, or practice is observed, the first course of action shall be to inform the supervisor. If the supervisor does not adequately address the safety concern, then the contractor's safety office shall be informed of the concern and details regarding any action or non-action taken to correct the issue. If there still is no action observed or the safety concern does not get addressed properly, the concern can then be passed by the concerned individual to the NSF OPP Safety Officer directly (phone number 703-492-7477).

The contractor's safety office shall set up an anonymous reporting system for all stakeholders. The contractor shall follow-up on all reports and use discretion as to which reports demand labor and resources.

The Occupational Safety and Health Act of 1970 gives an employee assurance that no discriminatory or discharge action will be taken against any employee who exercises his or her rights under the Act. In other words, NO retribution shall be taken on any employee or researcher that reports an unmitigated hazard, unsafe condition, or unsafe practice. If OPP becomes aware of any such retribution, there shall be an investigation, with corrective actions identified and implemented, with any and all means available, by the CO or other OPP leader (such as the science program manager or the university or institution's risk manager).

Appendix 12: Diving Standards (Antarctic Program Only) Purpose

Diving is an activity that carries some risk, which can be mitigated through training and experience. Diving in Antarctica carries additional risks associated with the environmental conditions and the often-remote diving locations, where diving support, medical support, and life-support infrastructure are limited or absent. This policy and these standard operating procedures are intended to provide a framework by which underwater diving for both operations and maintenance (O&M) and scientific purposes can be conducted safely.

Applicability

All personnel working under OPP auspices, to include O&M and scientific diving.

References

- 29 CFR 1910.401-440 and Subpart T
- AAUS Standards for Scientific Diving

Definitions

American Academy of Underwater Sciences (AAUS): The national association of scientific diving scientists, diving technicians, and diving safety officers that is generally responsible for setting standards for scientific diving.

Buddy diver: Second member of the dive team.

Certified diver: A diver who holds a current certification from an AAUS scientific diving program or recognized certifying agency.

Closed-circuit rebreather: A type of scuba equipment that recirculates all of the exhaled breathing gas.

Cylinder: A pressure vessel for storage of gases.

Decompression sickness (DCS): A condition with a variety of symptoms that may result from gas and bubbles in the tissues of divers after pressure reduction. DCS can be caused by exceeding no-decompression limits or exceeding the prescribed rate of ascent.

Depth: The dive log should denote the maximum depth of the dive.

Depth Certification: The depth to which a diver is certified to dive.

Dive: A descent into the water, an underwater activity utilizing compressed gas, an ascent, and return to the surface.

Dive computer: An electronic device for tracking depth and time and computing inert gas uptake and off-gassing.

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Dive site: The physical location of a dive.

Dive table: A profile or set of profiles of depth-time relationships, including their ascent rates, for particular breathing mixtures, to be followed after a specific depth-time exposure or exposures. (Synonymous with Decompression Table.)

Dive team: Divers and support individuals who are exposed to or control the exposure of others to hyperbaric conditions.

Diver: An individual in the water who uses an apparatus that supplies breathing gas at ambient pressure.

Diving mode: A type of diving requiring specific equipment, procedures, and techniques; for example, scuba, surface-supplied air, or mixed gas.

Diving Safety Officer (DSO): Individual with scientific diving expertise responsible for

advising the OPP on scientific diving matters, authorizing dive plans, and authorizing divers to dive under OPP auspices.

Dry suit: An exposure suit with airtight seals at the neck and wrists, which allows the introduction and exhaust of compressed air through valves and keeps the diver dry during the dive.

Hyperbaric: A condition defined by pressure greater than one atmosphere at sea level.

Lead diver: A certified scientific diver with the experience and training to lead the diving operation.

Mixed-gas diving: A diving mode in which the diver is supplied in the water with a breathing gas other than air.

No-decompression limits: The maximum depth and time parameters of a decompression algorithm for which staged decompression is not required.

Open water: Water not covered by a ceiling, ice or otherwise.

Principal investigator (PI): The scientist in charge of a science project, usually the senior scientist.

Pressure-related injury: An injury resulting from pressure disequilibrium within the body as the result of hyperbaric exposure. Examples include decompression sickness, pneumothorax, mediastinal emphysema, air embolism, subcutaneous emphysema, and barotrauma.

Recompression chamber: A pressure vessel for treating pressure-related dive accidents, such as cerebral arterial gas embolism (CAGE) and DCS. (Synonymous with Hyperbaric Chamber).

Regulator: A device for delivering air from high pressure to ambient pressure, usually for breathing purposes.

Scientific Diving Control Board (SDCB): The group of individuals that act as an appointed body of expertise to OPP in all matters relating to scientific diving

operations.

Scientific diving: All diving performed by individuals necessary to and part of a scientific research or educational activity, in conjunction with a project or study under the

jurisdiction of any public, private, or educational institution or similarly recognized organization, department, or group. To further clarify, OPP requires that:

- the underwater diving activity is an integral and essential part of the project;
- the project is a scientific, research, or educational activity consistent with OPP's mission to foster research and education in the sciences and engineering;
- the specific tasks that the diver performs under water are observational or involved in data gathering, rather than tasks usually associated with commercial diving; and;
- the work products of the diving activity are available to the public for review or examination.

SCUBA diving (scuba): A diving mode independent of surface supply in which the diver uses an open-circuit, self-contained, underwater breathing apparatus.

Supervisor of diving services: Individual with scientific diving expertise and logistical responsibilities, employed by the USAP Antarctic support contractor. He or she coordinates closely with the USAP DSO and safety and health officer to manage the USAP scientific diving program.

Surface-supplied diving: A diving mode in which the diver in the water is supplied from the surface with compressed gas for breathing, either from an air bank or from a compressor with volume cylinder.

Tender: A qualified person on the surface who is responsible for assisting and communicating with divers during a dive by various means, including a tether.

Tether: A line attached to a diver(s) to prevent their becoming lost underwater or under ice due to poor visibility or swift current. This is also a means of diver-to-surface communication.

Total Dive Time: Time from leaving surface to arriving back on surface. This is the time recorded in the USAP dive logs.

U.S. Antarctic Program (USAP): An organization of the U.S. government made up of scientists and support personnel who carry out research that can only be done or best be done in Antarctica. The program comprises research by scientists selected from universities and other research institutions and operations and support by a contractor and other agencies of the U.S. Government. The National Science Foundation (the U.S. Government agency that promotes the progress of science) funds and manages the program through its Geosciences Directorate, Office of Polar Programs.

Background

The Office of Polar Programs (OPP) of the Geosciences Directorate of the National Science Foundation (NSF) provides support for scientific diving associated with the research activities it funds. The OPP Standards for the Conduct of Scientific Diving have been developed to ensure that all scientific diving is

conducted in a manner that will minimize scientific divers' exposure to risk for accidental injury or illness associated with diving, while optimizing the researchers' ability to conduct research. These Standards have been patterned after the American Academy of Underwater Sciences (AAUS) *Standards for Scientific Diving*, a document that has provided a template for scientific diving at most academic and research institutions in the United States over the last fifty years. The approach described in the AAUS standards has been recognized by the Occupational Safety and Health Administration (OSHA) as providing an effective means of protecting scientific divers (i.e., Code of Federal Regulations, 29.1910 Subpart T). Although OSHA does not have jurisdiction in Antarctica, the fact that the Scientific Diving Control Board and these Standards for the Conduct of Scientific Diving meet OSHA requirements for scientific diving helps ensure the scientific diving program provides a framework of safety consistent with scientific diving in the United States. There are inherent risks in diving and doing so in Polar Regions involves additional risks because of the environmental conditions and remoteness. These standards provide a structure within which to manage those risks and allow underwater diving in support of the scientific enterprise to proceed safely. Each scientific diver should acknowledge those risks and commit to conducting their underwater diving activities in accordance with this policy and directed procedures.

Scientific Diving Program Administration

The OPP Scientific Diving Control Board falls under the administrative management of the NSF OPP Safety Officer and needs budget approval before initiating any travel or other actions (such as diving) that expend resources. The SDCB and Diving Safety Officer (DSO) have been appointed to assist OPP by providing the technical expertise necessary to operate a scientific diving program in support of OPP's polar research mission. The SDCB members are primarily volunteers from other academic or research institutions, providing their expertise as "special government employees" during the period of their assignment.

Diving Eligibility

OPP-funded or sanctioned research projects or related educational outreach activities can request underwater diving privileges under the auspices of the OPP scientific diving program. Diving may be authorized if the dive project meets the definition of scientific diving (see above), the dive plan follows this policy and directed SOPs, the participating divers are authorized to dive, and the operational requirements of the dive project can be met within the resources available. The OPP DSO will determine whether the dive plan and divers meet the requirements stipulated in this policy and SOP and can be authorized to dive. The NSF OPP Safety Officer and programs, operations, and logistics managers will determine whether the overall operational support requirements of the specific research project (including the underwater component) can be met within current resource constraints.

Responsibilities

Supervision and control of scientific diving operations shall be conducted as defined below.

Safety and Occupational Health Officer (SOHO)

The SOHO is responsible for the safety of all USAP participants and is the administrative position to which the SDCB and the DSO report. The SOHO has ultimate responsibility over all phases of the dive program and its management. The DSO exercises responsibility over all technical components of the scientific diving program.

Scientific Diving Control Board (SDCB)

The SDCB is a committee appointed by the OPP director to oversee the operational details of the scientific diving program. Members of the SDCB are selected based on their knowledge of and involvement in the scientific diving activities, preferably in Polar Regions. The SOHO, DSO, and the support contractor supervisor of diving services serve as non-voting, ex-officio members of the Board. The SDCB has the responsibility to:

- recommend changes to policy, changes in procedure, and amendments to this policy and SOP as the need arises;
- establish and/or approve training programs through which applicants can satisfy the requirements of this policy and SOP;
- develop guidance for safe diving activities (e.g., procedures, locations, conditions) in Antarctica;
- recommend new equipment or techniques for polar use; and
- perform other duties associated with USAP scientific diving, as listed in the SDCB charter.

OPP Diving Safety Officer

The OPP DSO acts as a liaison between the SDCB and the research divers. The DSO has the authority to act on behalf of the SDCB in all diving matters, pending acceptance by the SDCB at their next meeting. The DSO typically represents OPP in technical matters concerning diving operations, diving safety, or projects utilizing diving as a tool in their research. The DSO has the responsibility to:

- review and approve divers, diving plans, and diving locations submitted by the various research projects;
- evaluate and recommend equipment for polar diving use;
- recommend facilities to support scientific diving in polar regions; and;
- recommend new diving techniques or procedures to further scientific diving as a research tool in Antarctica.

Home Institution Diving Safety Officer

The home institution DSO oversees diving safety at the home institution, usually that of the principal investigator (PI), to which the scientific divers are affiliated. The home institution DSO acts in an advisory capacity to the OPP DSO, provides information on current scientific diver status under AAUS standards, and ensures that specialized training is provided to prepare individual divers for diving in Polar Regions. The home institution DSO certifies that the diver is current according to AAUS standards.

Contractor Supervisor of Diving Services

The supervisor of diving services is responsible for maintaining the OPP-owned dive equipment provided on-site, conducting diving pre-season orientations, orienting new science teams to conditions on-site, providing supervision and instruction during local familiarization dives, and generally supporting all scientific diving activities. The supervisor of diving services has the authority to suspend diving operations if in his or her opinion they are unsafe or unwise, pending review by the DSO. Other oversight duties, authorities, and responsibilities may be assigned this individual by the OPP DSO or the SOHO.

Principal Investigator (PI)

Generally, the PI acts as the lead diver, unless that authority is assigned to another more experienced diver in the project. The PI is responsible for ensuring all divers meet this policy's requirements and the operational requirements of the project.

The PI is responsible for ensuring maintenance of project-owned scuba equipment within 12 months for the following items (unless they are provided by OPP):

- Regulator
- Buoyancy compensator
- Dry suit
- Dive computer and gauges

Lead Diver

A project's lead diver is the person who has the diving experience, competency, responsibility, and reliability to conduct polar diving operations, and who has been designated responsible for managing the daily dive operations of the science team. The lead diver ensures that all divers in the team follow the procedures established in this policy and SOP.

Divers

Divers are the individuals having the experience, training, and authorization necessary to dive under the auspices of the OPP.

Tenders

Tenders are individuals who are trained to assist divers in their diving activities. They have no direct responsibility to intervene in diving operations. Tenders are assigned and trained by the supervisor of diving services and/or project's PI or lead diver.

Diving Control

Diving Approval

Upon the recommendation of the supervisor of diving services, the DSO determines whether a specific project's dive plan is consistent with the requirements of this policy and

SOP, based on the information submitted by the PI, and if so, approves the dive plan. Likewise, the DSO reviews each diver's credentials and approves or disapproves the diver, as appropriate. All divers must meet the following criteria:

- Certification for one year, including rescue training
- 50 open water dives
- 15 drysuit dives
- 10 drysuit dives within twelve months of Antarctic dive operations, with at least one dry suit dive logged within the last six months
- Minimum depth certification of 100 feet of sea water (fsw) for the McMurdo area and 60 fsw for Palmer and research vessels, with at least one dive to the diver's maximum certification depth within the last twelve months
- Current certification in first aid, cardiopulmonary resuscitation (CPR), and oxygen administration

Rebreather Diving

For diving using rebreathers, divers must meet these additional criteria:

- Trained in the use of nitrox
- Certified for one year on a rebreather, with a minimum of 25 open-water rebreather dives and a minimum of 25 hours underwater time
- Certified on the type of rebreather to be used
- A minimum of 12 open-water rebreather dives and a minimum of 12 hours underwater timer on the rebreather to be used, while using a drysuit, in the past year

Checkout Dives

Divers may be required to perform checkout dives with a party designated by the OPP DSO before deployment. Diving approval may be revoked for any diver who does not demonstrate proficiency during the in-situ familiarization dives conducted by the OPP DSO or supervisor of diving services in the field.

Oversight of Diving Activities

The SDS, the OPP DSO, and any member of the SDCB has the authority to suspend the diving privileges of any divers or dive team if, in his or her opinion, the divers are conducting themselves in a manner that is unsafe or inconsistent with this policy and SOP. Temporarily suspended diving privileges can be reinstated by the OPP DSO, subject to review by the SDCB and ultimate approval by the OPP SOHO.

Consequences of Violating Regulations

Failure to comply with this policy and SOP may cause for revocation or restriction of a diver's authorization to dive anywhere in the OPP's area of responsibility and authority.

Policies and Regulations

Diver Qualifications

In no case will individuals be allowed to dive under OPP auspices unless they are trained and proficient in the type of diving they plan to do and familiar with the equipment that they plan to use. Each diver shall have experience or training in the following:

- The use of instruments and equipment appropriate to the diving activity to be conducted;
- Dive planning and emergency procedures;
- CPR, diver rescue techniques, oxygen administration, and diving-related first aid;
- Diving-related physics and physiology and the recognition of pressure-related injuries; and
- Any supplemental qualifications the SDCB may impose (e.g., the number of dry suit dives or other qualifications not required by AAUS).

Diver Health

No dive team member shall be permitted to dive for the duration of any known condition likely to adversely affect the safety and health of the diver or other dive team members.

Solo Diving Prohibition

All dives conducted under OPP auspices shall be executed in such a manner as to ensure that every diver involved maintains constant, effective communication with at least one other comparably equipped, certified scientific diver in the water, except as permitted below. This buddy diver system is established to provide mutual assistance, especially in the case of an emergency. Dives should be planned around the competency of the least experienced diver. If effective communication is lost within a buddy team, then all divers shall surface and reestablish contact.

Diving Under Ceilings

- The dive access hole must be clearly marked by deploying a secured downline with flags and strobe lights, and the opening must be maintained to allow a normal exit from the water. If additional holes are required, they must be similarly marked and maintained.
- Untethered diving is permitted, provided a downline is deployed and divers adhere to the buddy system, and provided diving is conducted in clear water with adequate visibility to permit clearly seeing the access hole or its downline from anywhere the divers will be during the course of the dive.
- The use of a tendered tether is required when visibility restricts the diver from clearly seeing the access hole or downline, when shallow water restricts the diver's ability to see the entry hole, or if a danger is present.
- Divers must carry with them two independent regulators: a primary and a backup. These regulators may be attached to the same or to separate air sources.

- A buoyancy compensator in conjunction with a dry suit is not required when diving with a downline that reaches the bottom at a diveable depth.
- All dives must be tended. Additionally, during periods of darkness, at least two lights powered by independent sources must be in the hole.

Dive Computers and Pressure Gauges

All members of the diving team shall use an OPP-issued dive computer and a submersible, cylinder pressure gauge. Divers shall read and acknowledge understanding of the computer's manual, and all dives shall be planned and conducted within the computer's no-decompression limits.

Depth Limits

- The diving certification issued by the diver's home institution will authorize the holder to dive to, but not exceed, his or her certification depth.
- Individuals are authorized to dive to either their depth certification from their home institution or to a depth specified by the OPPDSO, whichever is shallower. Minimum depth certification for the McMurdo area is 100 fsw and for Palmer and research vessels is 60 fsw. Dives that require staged decompression are not authorized.
- An OPP-authorized diver may only exceed his or her depth certification by one step under the following conditions:

If accompanied by a diver certified to a greater depth.

If an emergency situation makes this necessary.

Diver Recall

A method of recalling the divers must be available at each dive site and understood by all divers and tenders.

Tended Diving with Communications

Single divers using surface-supplied or tethered-scuba modes of diving may be deployed, provided the following requirements are met:

- A full-face mask or helmet is utilized
- The system has a positive, two-way, voice-communication link
- The system has a tether, air supply hose (if appropriate), and communication line
- The diver has received a dive plan authorization number from the OPP DSO for this mode of diving to be used
- A fully equipped stand-by diver who is able to enter the water expeditiously is present.

Special Authorization

Special authorization by the OPP DSO is required for:

- Surface-supplied diving

- Blue-water diving
- Rebreathers (see Rebreather Standards, above, and Rebreathers, below)
- Mixed gases/oxygen enriched air (Nitrox)

Diving Operations

Pre-dive Information

Before conducting any diving operations, the PI must provide the following information in POLARICE or other communication option, as appropriate:

- The names of participating divers, their qualifications, and their depth certifications
- The name, telephone number, and relationship of the person to be contacted for each diver, in the event of an emergency
- The approximate number of proposed dives
- The locations of proposed dives
- The estimated depths and bottom times anticipated
- The proposed work, the equipment and/or boats to be employed, whether repetitive dives will be required, and details on any hazardous conditions anticipated.

Lead Diver

For each dive, one individual shall be designated as the lead diver. He or she shall be at the dive site during the diving operation. The lead diver shall be responsible for:

- Coordinating diving with other known activities in the vicinity that may interfere with the diving operation.
- Briefing the dive team members on:

dive objectives;

any unusual hazards or environmental conditions likely to affect the safety of the diving operation;

any modifications to diving emergency procedures necessitated by the specific diving operation; and

the need to report immediately any physical problems or adverse physiological effects, particularly symptoms of pressure-related injuries.

- Planning the diving operation, which shall include considerations of the safety and health aspects of the following:

Diving mode;

Surface and underwater conditions and hazards;

Breathing gas supply;

Thermal protection;

Dive equipment ;

Dive team assignment;

Residual inert gas status of dive team members;
Decompression schedule and altitude corrections; and
Emergency procedures.

Tenders

All dives conducted under the auspices of OPP shall be tended by personnel who shall remain on-site and at the surface during the course of the dive, and who are trained to tend that specific type of diving activity. At a minimum, tenders must be aware of emergency response procedures for the specific dive site, diver recall procedures, methods of extracting an unconscious diver from the water, and the location and use of the emergency oxygen kit.

Pre-Dive Checks

Each diver shall conduct a pre-dive functional check of his or her diving equipment in the presence of the dive buddy or tender. This functional check shall include, but not be limited to, confirming that:

- the cylinder valve positively opens and closes;
- the submersible pressure gauge works and registers the expected amount of air in the cylinder;
- the in-line shut-off valve on the primary regulator is in the open position;
- there is adequate air delivery and an absence of free flow (by inhaling but not exhaling on both primary and backup regulators);
- the dry suit inflator valve delivers air without free flow, and the dry suit exhaust valve vents air when open;
- the buoyancy compensator inflator valve delivers air without free flow, and the exhaust valve vents air when open;
- the integrity of mask and fin straps; and,
- any other gear operates according to specifications or expectations.

Refusal to Dive

It is the diver's responsibility and duty to refuse to dive if in his or her judgment conditions are unfavorable, or if he or she would be violating the precepts of his or her training, USAP diving standards, or his or her home institution's diving manual.

Agreement to Dive

No dive team member shall be required to be exposed to hyperbaric conditions against his or her will, except when necessary to prevent or treat a pressure-related injury.

Terminating the Dive

A diver may terminate a dive at any time if he or she feels it would be unsafe to continue. Divers should begin terminating their dives by notifying their buddies of the termination, stopping work, and commencing ascent. Divers must be at their safety stops with no less

than 20 cf of air (see Table 1) and must have exited the water with no less than 10 cf. Examples of situations necessitating dive termination include:

- Environmental conditions that become unsafe
- One or more divers becomes chilled
- Cylinder gas volume approaches 20 cubic feet
- Dive profiles approach required stage decompression
- Equipment failure that immediately or potentially jeopardizes the safety of the diver

Table 1: Minimum reserve pressures for selected cylinder configurations
(cf = cubic feet; psig = pounds per square inch gauge)

Cylinder Type (cf)	Pressure at 20 cf (psig)	Pressure at 10 cf (psig)
Single Steel 95.1	600	300
Single Steel 110	500	250

Equipment Requirements

- A functional oxygen kit shall be present at the dive site for every dive, and all participating divers and tenders shall be trained in its use.
- Each diver shall have a submersible pressure gauge that measures scuba cylinder pressure and can be monitored by the diver during the dive.
- Each diver shall have the capability of achieving and maintaining positive buoyancy.

Post-Dive Safety Checks

After completing a dive, each diver shall report any physical problems, symptoms of decompression sickness, or equipment malfunctions to the lead diver, PI, and the SDS.

Emergencies - Deviation From Regulations

Any diver may deviate from the requirements in this policy and SOP to the extent necessary to prevent or minimize a situation that is likely to cause death, serious physical harm, or major environmental damage. A written report of such actions must be submitted to the OPP SOHO, supervisor of diving services, and DSO explaining the circumstances and justifications for such action. Potentially dangerous diving incidents must be communicated to the on-site divers as soon as possible.

Dive Record Requirements

Personal Diving Log

Each diver shall log every dive. Completed log sheets shall be submitted to the supervisor of diving services or other approved representative, who will forward them to the DSO. If an emergency causes a diver to incur a staged decompression obligation, this shall be

noted in the log. The log shall be in a form specified by OPP and shall include at least the following:

- Dive date
- Names of diver and partner
- Total dive time
- Maximum depth attained
- Location of dive
- Dive computer used
- Regulator used
- Mixed gas composition and tables, if used
- Mode of diving (scuba, surface supply)
- Safety stop depth and time
- Any accidents, equipment failures, or dangerous incidents occurring during the dive

Record Maintenance

The supervisor of diving services and USAP shall maintain records for each authorized scientific diver, including these items for at least the specified period:

- Record of dive - one year, but five years if there has been a pressure-related injury
- Pressure-related injury assessment - five years
- Records of hospitalization - five years
- Equipment inspection and testing records - current entry or tag, or until equipment is withdrawn from service

Availability of Records

Institutional DSO's are required by AAUS standards to maintain certain permanent records. Divers must agree to the release of that information deemed necessary for the DSO to make a reasonable safety and health judgement regarding the diver's qualifications to dive. Failure to provide sufficient information may result in the denial of the OPP diving authorization.

Dive Accident Reporting

The diving program has an official and valid interest in all diving incidents and accidents. Analysis of incidents is important so that causes can be determined and corrected to prevent future occurrences and/or injuries that may impact diving readiness and authorizations.

The supervisor of diving services and/or McMurdo or Palmer Station medical personnel shall report to the DSO any diving-related injury or illness that requires any dive team member to be hospitalized for 24 hours or more, or any episode of unconsciousness related to diving activity. The circumstances of the incident and the extent of any injuries or illnesses shall be specified to the extent allowable by patient privacy regulations, taking into account the program's legitimate

requirement to know the physical readiness of all divers to safely dive. The DSO shall maintain these records, which shall also contain:

- a description of symptoms - including depth and time of onset;
- a description and results of treatment;
- a printout of the relevant dive computer profile(s);
- a dive history for the previous seven days; and
- any history of flying within those seven days.

The supervisor of diving services and the DSO shall prepare a report of any diving accident requiring recompression or resulting in a serious injury, e.g., decompression sickness or gas embolism, and shall notify the OPP SOHO and the diver's home institution DSO.

Incidents that do not involve injuries, e.g., free-flows and other equipment malfunctions, shall be recorded in the dive log.

Diving Equipment

Equipment Maintenance

The USAP issues regulators and dive computers for use by scientific divers. This equipment shall be maintained according to manufacturer's specifications. The PI is responsible for ensuring that all grantee-owned scuba equipment has been provided regular maintenance within the past 12 months.

Equipment Inspection

All inspections, tests, maintenance, and record keeping referred to in this section must be performed by the supervisor of diving services or other approved individual.

Equipment Records

Each equipment modification, repair, test, calibration, or maintenance service shall be logged for the equipment listed below. The logs shall include the date and nature of work performed, serial number of the item, and the name of the person performing the work.

Compressors	Submersible pressure gauges
Regulators	Depth gauges
Scuba cylinders	Cylinder valves
Diving helmets	Dive computers
Gas control panels	Air storage cylinders
Air filtration systems	Dry suits

Breathing Masks and Helmets

Breathing masks and helmets shall have:

- a non-return valve at the attachment point between helmet or mask hose, which shall close readily and positively;
- an exhaust valve; and

- a minimum ventilation rate capable of maintaining the diver at the diving depth.

Rebreathers

- Only those models of rebreathers specifically approved by the DCB shall be used
- Current service records of the rebreather must be submitted to the DCB
- Divers must carry sufficient bailout, configured in a way to make it available to self or buddy, to allow egress from the water from any point in the planned dive
- Oxygen partial pressures shall not exceed 1.4 atmospheres at depths greater than 30 fsw, or 1.6 at depths less than 30 fsw
- All dives will be within the no-decompression limits of the unit

Scuba Air Cylinders

Scuba cylinders:

- shall be designed, constructed and maintained in accordance with provisions of the applicable Unfired Pressure Vessel Safety Orders;
- must be hydrostatically tested in accordance with Department of Transportation (DOT) standards; and
- must have an internal visual inspection before they are issued for use, and thereafter at intervals not to exceed 12 months, or sooner if they are suspected of having internal moisture.

Scuba Cylinder Valves

Cylinder valves shall be functionally tested at intervals not to exceed 12 months.

Backpacks and Weight Systems

Backpacks and weight systems shall be regularly examined by the persons using them. When used in open water, all weight systems and scuba backpacks worn by the diver shall be equipped with quick release devices designed to permit jettisoning of the gear. The quick release device must operate easily with a single motion from either hand.

Pressure Gauges

Gauges shall be inspected and tested before the first use of the season, and thereafter as necessary.

First Aid Supplies

Both oxygen and a first-aid kit adequate for the diving operation shall be available at the dive location. When used in a hyperbaric chamber or bell, the first-aid kit shall be suitable for use under hyperbaric conditions.

Underwater Tools

Hand-held electrical tools and equipment used under water shall be specifically approved for this purpose, and they shall not be supplied with power until requested by the diver.

Auxiliary Equipment

Any auxiliary equipment may be subject to approval by the SDCB.

Breathing Air Standards

Breathing air for scuba shall meet Compressed Gas Association (CGA) Grade E air quality standards.

Compressor Systems

- Low pressure compressors used to supply breathing air shall be equipped with a volume cylinder, with a check valve on the inlet side, a pressure gauge, a relief valve, and a drain valve.
- Compressed air systems over 500 psi shall have slow-opening shut-off valves.
- All air compressor intakes shall be located away from areas containing exhaust or other contaminants.

Compressor Operation and Test Records

- Gas analysis and air tests shall be performed on breathing air compressors by the supervisor of diving services or other approved representative at regular intervals of not more than 100 hours of operation or 6 months, whichever occurs first. The results of these tests shall be entered in a formal log and be maintained by the supervisor of diving services.
- A log shall be maintained by the supervisor of diving services or other approved representative showing any operation, repair, overhaul, filter maintenance, or temperature adjustment for each compressor.

Oxygen Safety

- Equipment used with oxygen or mixtures containing over forty percent (40%) oxygen by volume shall be designed and maintained for oxygen service.
- Components (except umbilical) exposed to oxygen or mixtures containing over forty percent (40%) oxygen by volume shall be cleaned of flammable materials before being placed in service.
- Oxygen systems over 125 psig shall have slow-opening shut-off valves.

Construction or O&M Diving

Background

Though not as frequently executed as scientific diving, there are occasions where O&M or even construction diving is required. This type of diving presents additional hazards as compared to scientific diving, such as underwater welding, crane hazards, electrical hazards, and pressure differentials that create sucking forces, among others. Many of these hazards require lockout/tag-out procedures.

Procedures

- Compliance is required with all requirements in 29 CFR 1910.410.
- All administrative steps required for scientific diving shall also be complied with for O&M and construction diving, to include submission of a dive plan to the OPP Diving Safety Officer for review and acceptance before the dive. A job hazard analysis (JHA) shall be completed for each working dive and shall be reviewed by the dive supervisor on-site before the dive. All members of the dive team shall sign the JHA, indicating they understand the hazards and the controls that will be utilized to mitigate risk. For *emergent diving* needed asap due to severe risk to life, life critical property, or severe environmental loss, a JHA shall be developed and provided to the local safety office, the NSF Rep, and NSF Station Manager for awareness. If none of those parties are available, the Dive Log, JHA, and short justification statement shall be emailed into the NSF OPP Diving Safety Officer as soon as reasonably possible after the dive for an after action review.
- Safety training, as required by OSHA for specific activities, such as welding and lockout/tag-out, shall be provided to dive team members as needed, and it shall be documented. In addition, the divers must have experience performing similar types of underwater work in the past, e.g., welding.

Appendix 13: Fall Protection

Purpose

This appendix provides the requirements for fall protection and applies to both contractors and researchers throughout the OPP. Falls are one of the leading causes of work fatalities and managing this risk is imperative to the success of the OPP science mission.

References

- 29 CFR 1910, Subpart D Walking-Working Surfaces
- 29 CFR 1926 Subpart M Fall Protection

Policy

All contractors are responsible for establishing, implementing, and managing a fall protection program that complies with this policy, 29 CFR 1910 Subpart D, and 1926 Subpart M, and they should supplement this policy appendix and these regulations with their own standard operating procedures.

1. The fall protection threshold height requirement is six feet (1.8 meters) for ALL work and research, unless specified differently below. This includes steel erection activities, *tower climbing and erection*, systems-engineered activities, prefabricated metal building erection, residential construction, and scaffolding work.
2. Fall protection also applies to all OPP-owned or operated permanent facilities with open-sided floors, platforms or unprotected edges four feet (1.2 meters) or more above adjacent floor or ground level.
3. Fixed ladders shall comply with 29 CFR 1910.27, wherein landing platforms shall be provided every 30 feet of height or fraction thereof, except that, where no cage, well, or ladder safety device is provided, landing platforms shall be provided for every 20 feet of height or fraction thereof. Existing fixed ladders that do not meet these requirements shall be brought to the attention of NSF OPP.
4. Workers or researchers exposed to fall hazards shall be protected from falling to a lower level by the use of standard guardrails, work platforms, temporary floors, safety nets, engineered fall protection systems, personal fall arrest systems, or the equivalent, in the following situations:
 - A. Whenever workers or researchers are exposed to falls from unprotected sides or edges, access ways, unprotected roof edge or floor openings, holes and skylights, unstable surfaces, leading edge work, scaffolds, formwork, work platforms, re-bar assembly, steel erection, and engineered metal buildings
 - B. Whenever workers or researchers operate on access ways or work platforms over water or ice, machinery, or dangerous operations
 - C. When workers are installing or removing sheet piles, h-piles, cofferdams, or other interlocking materials from which they may fall six feet (1.8 meters) or more
 - D. Wherever there is a possibility of a fall from any height onto dangerous equipment, into a hazardous environment, or onto an impalement hazard

- E. Whenever connectors are working at the same connecting point (for steel erection activities), they shall connect one end of the structural member before going out to connect the other end. The connectors shall always be tied off 100%
- 5. The order of control measures (the hierarchy of controls) to abate fall hazards or to select and use a fall protection method to protect workers and researchers performing work or science at heights shall be:
 - A. **Elimination**
Remove the hazard from work areas; change the task, process, or controls; or use other means to eliminate the need to work at heights, with its subsequent exposure to fall hazards (i.e. build roof trusses on ground level and then lift into place, or design a change by placing a meter or valve at a lower level). This control measure is the most effective.
 - B. **Prevention** (passive or same-level barrier)
Isolate and separate fall hazards from work or research areas by erecting same-level barriers, such as guardrails, walls, covers, or parapets.
 - C. **Work platforms** (movable or stationary)
Use scaffolds, scissor lifts, work stands, or aerial lift equipment to facilitate access to work or research locations and to protect personnel from falling when performing work at high locations.
 - D. **Administrative Controls**
Introduce new work practices that reduce the risk of falling from heights or warn people to avoid approaching a fall hazard (i.e. warning systems, warning lines, audible alarms, signs, or training for workers and/or researchers to recognize specific fall hazards).
 - E. **Personal Protective Systems and Equipment**
Use fall protection systems, including (in order of preference) restraint, positioning, or personal fall arrest. All systems require the use of full body harness, a means of connecting, and a safe anchorage system.

Appendix 14: Research Safety

Purpose

This appendix outlines expectations for conducting research so no one is put at risk by NSF-funded activities. OPP expects researchers to follow federal guidelines, which include, but are not limited to:

- Transporting materials in accordance with DOT requirements.
- Adhering to lab safety regulations outlined by OSHA or other federal safety standards; unless a more stringent local requirement exists, for example in the contractor managed Chemical Hygiene Plan.
- Complying with all permitting requirements pertinent to their chosen field locations and research topics.

References

- OSHA 3404-11R, Laboratory Safety Guidance (2011)
- 49 CFR Parts 171-177: Hazardous Materials Regulations (DOT)

Compliance Requirements

Home universities and institutions are ultimately responsible for the safety of their research teams, providing training to their research teams, and the teams' activities in the field. OPP expects safety to be a top priority for all individuals participating in federally funded research. Additionally, OPP requires compliance with the following, so research teams do not put themselves or others at risk.

1. All grantees shall comply with the OPP Code of Conduct. Non-compliance could result in removal from the field and **may be debarred**.
2. Research proposals shall be reviewed for safety integration by both the NSF OPP Safety Officer or designee and the contractor safety office. Risk shall be identified and recommendations made to the university or institution from which the research proposal came so that control measures can be implemented before the research teams deploy. This proactive approach to safety needs to be thorough and may require consultation with technical safety experts not commonly associated with the proposal process depending on the activity (e.g. radiation or drilling activities).
3. Researchers should include in their proposals any need for a weapon or bear guard. Researchers who choose to bring their own weapons shall notify OPP before they arrive on-site, and they shall have taken a recognized weapons training course specific to the weapon in question within the last three years. Weapons and ammunition shall be stored separately and in proper casing. Contractors shall write up SOPs covering specifics on this topic, and after OPP approval, they shall be considered an extension of this policy.
4. Any researchers using radioactive materials need approval by the qualified Radiation Safety Officer (RSO) at their home institution. Both the on site laboratory manager and NSF OPP shall be made aware of this BEFORE the radioactive materials arrive on-site.

Deviations from the NSF radioactive material authorizations are prohibited without prior approval of the Radiation Safety Officer from the grantee's home institution and the NSF OPP official. The NSF OPP Safety Officer will be kept informed of all matters involving radioactive materials.

5. All accidents *shall* be reported in accordance with the accident reporting section, so that incident trends can be tracked to improve the safety of future researchers. Any concerns or reporting about safety can be done anonymously by directly contacting the NSF OPP Safety Officer by email or phone (jfentress@nsf.gov, (703) 292-7477). At the end of the season, this incident information shall be compiled (trend analysis) and shared among research universities and institutions so that lessons-learned are shared.
6. When feasible, OPP field science managers and contractor safety (or contractor field safety) should visit field research sites (spot check) in order to ensure safety is being incorporated into daily research activities.
7. Tensions regarding the appropriateness of safety rules and regulations are bound to arise between grantees, contractors, and federal employees working in the extreme environments of the Arctic and Antarctic. OPP expects that everyone involved with federally funded research actively engage in a culture of safety and prioritize a collective and continuous commitment to emphasize safety over competing goals. Further, as a reminder, if a stipulated safety requirement cannot be complied with or is not feasible, the research team can apply for a waiver or variance using the process identified and by contacting the NSF OPP Safety Officer.

Appendix 15: Vehicles, Machinery, and Equipment

Purpose

The polar environment presents additional risk of injury or fatality when operating vehicles, machinery, and equipment, so risk must be managed effectively. The extreme cold can hamper equipment and machinery function and can present traction challenges (as well as the hazard of a vehicle falling through the ice). The purpose of this policy appendix is to reduce this serious risk.

Applicability

This policy applies to all vehicles, machinery, and equipment owned by OPP or operated in support of OPP operations. Compliance with state and host nation laws is also required, with the most stringent requirements prevailing.

Policy

General Requirements

Every person operating machinery and mechanized equipment, all-terrain vehicles (ATVs), unmanned vehicles (UVs), or other specialty (snow) vehicles shall be properly trained, qualified (by license, certificate, or permit), and designated by the employer in writing to operate such equipment. Proof of qualification and/or competence to operate equipment (such as a certificate or permit) shall be available for government review at the work location.

Inspections, Tests, Maintenance, and Repairs

- Inspections, tests, maintenance, and repairs shall be conducted by a qualified person, in accordance with the manufacturer's recommendations.
- Before initial use, vehicles not otherwise inspected by state or local authorities shall be inspected by a qualified mechanic and determined to be in safe operating condition and in compliance with all required vehicle safety standards. This one-time inspection shall be documented and available for review at the work site.
- All vehicles and equipment shall be inspected on a scheduled maintenance program.
- Before each use, but not more than daily, vehicles and equipment shall be checked by the operator to ensure the following parts, equipment, and accessories (as applicable) are in safe operating condition and free of apparent damage that could cause failure while in use:

Service brakes, including trailer brake connections

Parking system (hand brake)

Emergency stopping system (brakes)

Tires

Horns

Steering mechanism

Coupling devices

Seat belts

Operating controls

Safety devices (e.g. back up alarms and lights, fire extinguishers, first-aid kits, window punch, seatbelt cutter)

Accessories, including lights, reflectors, windshield wipers, and defrosters, where such equipment is necessary

Guarding and Safety Devices.

Lights

When visibility is limited or when work is conducted in darkness, additional portable lighting shall be utilized where practicable, and all vehicles shall have functioning headlights and tail lights.

Reverse Signal (Back-Up) Alarm

- All self-propelled construction and industrial equipment, dump trucks, and cargo trucks for which the trailer/body permanently blocks the view to the rear, whether moving alone or in combination, shall be equipped with a back-up alarm.
- Equipment designed and operated so that the operator is always facing the direction of motion does not require a back-up alarm.
- Back-up alarms shall be audible and sufficiently distinct to be heard above surrounding noise level.
- Alarms shall operate automatically upon commencement of backward motion and shall operate throughout the entire backward motion.
- Commercial cargo vehicles (such as pick-up trucks, utility cargo or tool trucks, and flatbed cargo trucks intended for roadway use) that have a normally clear view through the rear window are not required to have back-up alarms. If the view is temporarily obstructed by a load or permanently blocked by a utility or tool box or other modification, then a signal person may be used if the value outweighs the risk, as determined by an AHA. In lieu of a signal person, a backup alarm must be installed.
- Removing or disabling a back-up alarm is strictly prohibited.

Guarding

- All belts, gears, shafts, pulleys, sprockets, spindles, drums, flywheels, chains, or other reciprocating, rotating, or moving parts of equipment shall be guarded when exposed to contact by persons or when they otherwise create a hazard.
- All hot surfaces of equipment, including exhaust pipes or other lines, shall be guarded or insulated to prevent injury and fire.

- Substantial overhead protection shall be provided for the operators of forklifts and similar material handling equipment.
- A safety tire rack, cage, or equivalent protection shall be provided and used when inflating, mounting, or dismounting tires on split rims or on rims equipped with locking rings or similar devices.
- No guard, safety appliance, or device shall be removed from machinery or equipment, or made ineffective, except for making immediate repairs, lubrications, or adjustments, and then only after the equipment has been de-energized and a hazardous energy control program (lockout/tag-out) implemented. All guards and devices shall be replaced immediately after repairs and adjustments are completed and before power is turned on.
- Seatbelts must be worn in all motor vehicles where the manufacturer has installed them. Seatbelts that have been damaged or removed shall be replaced immediately and meet the requirements of 49 CFR 571 and/or Society of Automotive Engineers (SAE) Standard J386.

Falling Object Protective Structures (FOPS):

- All bulldozers, tractors, or similar equipment used in clearing operations shall be provided with guards, canopies, or grills to protect the operator from falling and flying objects, as appropriate to the nature of the clearing operations.
- FOPs for other construction, industrial, and grounds-keeping equipment will be furnished when the operator is exposed to falling object hazards.
- FOPs will be certified by the manufacturer or licensed engineer as complying with the applicable recommended practices of SAE Standards J231 and J1043.

Operating Rules

- Only cellular phones with hands-free devices may be used in moving vehicles.
- Text messaging while operating a vehicle is strictly prohibited.
- Using portable headphones, earphones, or other listening devices (except for hands-free cell phones) while operating a motor vehicle is prohibited.
- Operators of motor vehicles shall not smoke or drink alcohol while the vehicle is in motion (nor should alcohol be consumed at any point during the workday).
- GPS or other personnel locating systems shall be considered (and vetted and approved by the responsible OPP program manager) for all moving vehicles, including snowmobiles, so that operators can find their way back in inclement weather or can be located in an emergency.
- Vehicles shall not be driven at speeds higher than necessary to accomplish the mission without increasing risk (such as impending severe weather, where increasing speed slightly might be life-saving, based on a risk assessment).

- No vehicle or combination of vehicles hauling unusually heavy loads or equipment shall be moved until the driver has been provided with the required permits (as applicable), the correct weights of the vehicles and load, and a designated route to be followed.
- When maneuvering or performing back-up operations, operators will take precaution. If a signal person or spotter is not used (or not available), operators will walk behind their vehicle to view the area for possible hazards or obstructions before performing back-up operations. All vehicle incidents that occur as a result of backing operations shall be reported to the contractor's safety office or professional, and a process to improve operations will be established, documented in a SOP, and implemented, particularly for operators with repeat incidents.
- For snowmobiles, ATVs, or other types of specialty vehicle, a driver qualification and training program shall be established specific to the vehicle. In addition, a SOP that includes, at a minimum, safe operations, limits of operational work areas, required PPE (such as helmets, which are required for snowmobiles *and* ATVs), and vehicle safety equipment requirements shall be established for all such vehicles.
- Personnel who are involved in vehicle incidents where there is damage more than what would be considered minor (such as a fender bender), shall be cleared by a medical professional (paramedic or nurse, at a minimum) before operating another motor vehicle and/or returning to duty. Vehicle incidents that occur in remote locations without medical support would be exempt from this policy, but operators should consider obtaining a medical evaluation upon returning to an area where medical support is available. The employee shall not be responsible for paying for this medical clearance, where payment is expected.

Appendix 16: Snowmobile/ATV Helmet and Training

Purpose

The purpose of this appendix is to establish a uniform policy on the use of snowmobile and all-terrain vehicle (ATV) helmets.

Applicability

The policy applies to all OPP participants.

Policy

All participants operating a snowmobile or ATV, or riding on a sled towed by a snowmobile or ATV, shall wear a helmet. The helmet must be approved by the Department of Transportation (DOT) or Snell Foundation for snowmobile or ATV use. Climbing and rigging helmets are permitted in limited circumstances for personnel in transit during tower inspection and maintenance.

All participants using a snowmobile or ATV shall be trained on the equipment used. Training shall take into account the terrain to be accessed (e.g. side of a mountain or volcano). Only personnel needing to use snowmobiles or ATVs for mission activities, and for which such use is approved by their supervisory chain, shall operate them. Speed shall be the minimum needed to accomplish the operation.

Enforcement

Strategies for enforcement shall be written into SOPs to support this policy, and failure to comply will be handled proactively.

Appendix 17: Ships and Vessels

Purpose

The purpose of this section is to ensure that the risk of serious injury or fatality is mitigated in ship operations.

Applicability

The policy applies only to the USAP.

Policy

1. Ships and vessels meeting the United States Coast Guard (USCG) requirement for inspection shall maintain USCG compliance.
2. All passengers shall receive a safety briefing before the vessel departs that covers potential hazards *such as the ship lurching forward or sideways during rough seas*, emergency procedures, and incident reporting requirements. This briefing shall be documented with passenger signatures indicating they understand.
3. For cargo unloading and loading, a coordinated safety plan shall be developed with all the various stakeholders (e.g. New Zealanders, Navchaps, contractors), documented, and kept close to the dock for review if needed during operations. The plan shall also contain individual AHA's, broken out by activity, such as crane operations, rigging, and transportation. The enforcer of this plan is the onsite contractor. NSF expects that all organizations comply with the agreed-upon safety plan. Being that NSF will bear the burden for emergency support if a serious incident or fatality occur, NSF expects compliance with the contractor's safety requirements to include fall protection when workers are on top of containers. (See High Risk Safety Planning in Appendix 2.)
4. Lines
 - A. Lines shall be carried to shore, with risk managed appropriately, and this decision shall be the captain's. The hierarchy of line carrying, from least risky to most risky is: 1) tossing by hand (if able), 2) carried across by small boat, 3) shot from gun, and 4) launched with rocket launcher. All weapon and explosive safety requirements shall be documented and enforced.
 - B. Before shooting lines, clearance zones shall be established and maintained. At common access routes (walking or riding), signage warning personnel not to enter shall be in place.
 - C. Personnel at tie-up points on shore shall be protected if line is being shot by gun or rocket launcher.
 - D. Just before line shooting is to begin, and at a minimum 30 minutes prior, and where possible, a warning shall be communicated broadly to all in the vicinity to follow the safety requirements on clearance zones or any other contractor-dictated safety precaution.

Appendix 18: Antarctic Field Safety

Purpose and Scope

The purpose of this section is to ensure that the risk of serious injury or fatality is mitigated in all field operations. Field operations in Antarctica are inherently dangerous activities. Field work carries additional risks associated with varying environmental conditions and remote settings often far from medical support. This policy and associated trainings, in support of it, are intended to provide a framework by which field operations can be conducted safely. The term “field” in this appendix refers to all locations and camps outside of the three major stations, vessels, fixed traverse routes and local airfield complexes. Fixed large seasonal camps, hard walled camps and small ASC or grantee-staffed smaller camps are considered remote when supported by fixed or rotary wing, ground traverse platforms, skidoos or other approved ground transportation.

Applicability

This policy applies only to the USAP field program.

Field Operations

Grantee

All McMurdo-based field deploying grantee groups will undertake a mandatory risk assessment meeting with the field support supervisor, field-training supervisor and SAR supervisor to identify, describe and mitigate where possible hazards present for a particular project. This meeting is documented and made available for the EOC and relevant departments in McMurdo. If the project is Marine/Palmer-based, grantees will conduct the risk assessment meeting with the peninsular field supervisor. This is in support of Appendix 14: Research Safety. It is the responsibility of the PI to ensure all required trainings and briefs depending on field location are completed by all members of the deploying field team.

Contractor

The contractor shall complete JHA or an Activity Hazard Analysis (Appendix 18 PESH Forms) prior to field deployment activities. All documents related to anticipated field activities will be made available to the EOC upon request. The field management department shall develop, maintain and ensure compliance with all relevant SOP's related to field operations.

All Participants

All USAP participants traveling to the field are responsible for having the appropriate and relevant field trainings. If a participant is unclear on what training is required for safe field operations they should contact their POC, lead PI, hiring supervisor or applicable agency representative for clarification.

Courses are not intended to develop advanced field skills (such as mountaineering or traversing crevasse fields) in the inexperienced person. Rather, they familiarize proficient people with specific situations they might encounter in the Antarctic. Leaders of remote field projects should select team members with wilderness survival skills.

Participants supported outside USAP facilities

For USAP participants supported by other national programs the field safety policies of the relevant national program will be followed.

Training and briefings

Antarctic Field Safety

Those traveling off the established road network or off the recreational trail system are required to take this course every season. Additional trainings included in AFS are Helicopter Safety and Sea Ice Refresher.

Helicopter Safety is required to ride in helicopters and consists of a video. Those working on the sea ice are required to take the Sea Ice Refresher portion of the course every year before traveling on the sea ice.

Prerequisite: The participant must have taken the full sea ice class or the sea ice refresher within the past five seasons. If it has been longer than five seasons since the last refresher, the participant must take the full sea ice class again

Dry Valley Shakedown

This course is required by all those who will be working from self-supported field locations camping on dirt and/or ice. These are camps where no structures are already standing at put-in and food, water, and 24-hour heat are not provided by a separate crew. This course is required every year.

Deep field Shakedown

This course is required by all those who will be working from "self-supported" field locations camping on snow. These are camps where no structures are already standing at the time of camp put-in and food, water, and 24-hour heat are not provided by a separate crew. Required every year.

Crevasse Rescue Glacier Travel

Required by all personnel working on glaciers above the firm line and crevassed areas of an ice sheet or ice shelf. There are exceptions depending on the logistics, historical information, nature of glacier, and requirements of field work. The FST department will decide whether this course is necessary depending on specifics of study area. Required every year.

Sea Ice Safety

Required by all USAP participants who will be traveling on the sea ice if this course or the Sea Ice Refresher training was taken more than five seasons prior.

Sea Ice edge safety

Required by all participants working at or near the ice edge. Required every year.

Altitude Training

Required by all USAP participants traveling above 8,000 feet elevation without close support. Close support is defined as helicopter or fixed wing remaining at study site while field work is conducted. Required every year.

Field Plan Risk Assessment

All grantee field teams will participate in a Field Risk Assessment process and final meeting with members from the Field department. The document summarizing this meeting needs to be completed and agreed on by all involved parties before departing to the field. Required every year. This is in support of Appendix 14: Research Safety.

Peninsula Field Training

Required annually for all personnel who will be working from the vessel on islands or sea ice.

Island Survival

A one-hour class required for all small boat operators and recommended for frequent small boat passengers.

Palmer Backyard and Glacier Travel

A 15 min video is required for personnel who visit the Backyard or the glacier behind Palmer Station.

McMurdo Outdoor Safety Lecture (OSL)

This course is required annually for all USAP participants who want to recreate from McMurdo Station on any established trail where checkout is required

McMurdo Winter Over Safety Lecture (WOST)

Required for all USAP personnel who will spend any amount of time in McMurdo during the winter season. Covers winter specific information such as travel and communication protocol and survival bag requirements.

References

- *USAP Field Manual Continental Version*
- *USAP Field Manual Peninsular Version*
- *USAP Basic Field First Aid*
- *Stay Healthy at Altitude in Antarctic*
- *2018-2020 USAP Participant Guide*

Appendix 19: Safety Forms

The forms on the following pages may be printed out and used. Contractor-developed forms may be used in lieu of the first three forms, provided the contractor forms contain the same information, at a minimum:

PESH-FORM_2000.10-1	Fire Prevention Checklist for Administrative Occupancies
PESH-FORM_2000.10-2	Confined Space Entry Permit
PESH-FORM_2000.10-3	Activity Hazard Analysis

The following form must be used as it is, with no substitution permitted:

PESH-FORM_2000.10-4	Safety Requirement Waiver/Variance Request Form
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Fire Prevention Checklist for Administrative Occupancies

Instructions: An occupant appointed by the supervisor completes the checklist monthly for each building. Maintain in file for one year. Corrective actions should be noted on reverse side.

Section: _____ Date: _____

1. Are emergency phone numbers posted? _____
2. Are hallways and stairs free of obstructions? _____
3. Areas near heating appliances free of combustibles? _____
4. Are fire extinguishers visually inspected and operating instructions attached? _____
5. Do all electrical fixtures and appliances appear to be in a safe condition? _____
6. Are extension cords UL or CE listed? _____
7. Are extension cords overloaded? (No more than three items may be plugged into a non-circuit breaker protected extension cord.) _____
8. Are appliances located on a noncombustible base and unplugged if not in use? _____
9. Are exit lights and emergency illumination operational? _____
10. Are exits and exit doors free of obstructions and unlocked during hours of operation? _____
11. Is the building fire alarm system operational? _____
12. Are transformers unplugged if attached equipment is not in use? _____

Printed name of inspecting person

Signature of inspecting person

Confined Space Entry Permit

Instructions: A confined space entry permit can be in whatever format desired, but the information listed on this form must be included, at a minimum. This permit may be used in lieu of a contractor-developed form.

Location of space _____

Description of space _____

Employee authorizing entry _____ Date _____

Purpose of authorization _____

Entry authorized from (time) _____ to _____ Date _____

Authorized entrants _____

Authorized attendant(s) _____

SPACE HAZARDS AND CONTROLS

Identification of gas meter used and calibration date: _____

Asphyxiation: oxygen deficiency ☐ chemical ☐ engulfment ☐

Flammable/explosive: dust ☐ chemical ☐ (specify) _____

Toxic: chemical ☐ (specify) _____

Unauthorized activation: mechanical _____ electrical _____

The confined space shall be isolated or potential hazards controlled by:

Depressurization ☐ Purging and cleaning pipe ☐ Lockout/tagout ☐

Blanking/capping pipe ☐ Other ☐ (specify) _____

Rescue services/equipment are available: on-site ☐ outside ☐

Communication equipment/procedures to be used:

The following personal protective equipment have been assigned to, and shall be worn by, entrants:

Hot work [may]/[shall not] be conducted in this space.

If hot work is permitted, the following controls shall be utilized:

TESTING AND MONITORING

The space has an oxygen content of _____ and is [safe]/[unsafe]

The space has been monitored and contains the following concentration of toxic hazards:

carbon monoxide _____

hydrogen sulfide _____

other (specify) _____

The space has been tested and contains the following percentages of lower flammable limit of flammable/explosive chemicals (specify):

Monitoring will be conducted: continuously ☐ or at intervals ☐

AUTHORIZATION: All actions and conditions necessary for safe entry to, work in, and exit from the confined space have been performed. Entry is permitted on the date and time, and for the duration, specified above.

(Signature of individual authorizing entry)

CANCELLATION: All entrants have exited the confined space and this permit is canceled.

_____ Time _____
(Signature of individual authorizing entry)

Activity Hazard Analysis

Instructions: Contractors may develop and use their own Activity Hazard Analysis form, provided it contains the information listed below, at a minimum. Otherwise, this form may be used.

1. Contract No.	2. Project	3. Facility
4. Date	5. Location	6. Estimated Start Date
7. PRINCIPAL STEPS	8. POTENTIAL HAZARDS	9. RECOMMENDED CONTROLS
10. EQUIPMENT TO BE USED	11. INSPECTION REQUIREMENTS	12. TRAINING REQUIREMENTS
Risk assessment code (RAC) based on probability of an incident occurring and severity of loss if one occurs (Low-Med-High):		
13. Contractor (Signature & Date)		
14.If RAC medium or high, signature of NSF representative on site, or if none, appropriate NSF program manager/ABM remote: _____		15. NSF ABM: (Signature & Date)

National Science Foundation/Office of Polar Programs Safety Requirement Waiver/Variance Request Form

WAIVER INFORMATION

PROJECT: Click here to enter text. DATE: Click here to enter a date.
SUBJECT: Click here to enter text.

1. SAFETY REQUIREMENT AND/OR CODE REQUIREMENTS TO BE WAIVED:

Click here to enter text.

2. SAFETY REQUIREMENT/STANDARD/CODE REFERENCES:

Click here to enter text.

3. DEFINE WHETHER A TEMPORARY OR PERMANENT VARIANCE IS BEING REQUESTED:

- EXPLAIN WHAT LENGTH OF TIME IS REQUIRED AND WHY;
- IS THE REQUEST A WAIVER OF REQUIREMENT, A DELAY OF IMPLEMENTATION OR A SUGGESTION OF AN ALTERNATIVE SOLUTION?

Click here to enter text.

4. RATIONALE FOR WAIVING THE SAFETY REQUIREMENT/STANDARD/ CODE

A. GIVE A COMPLETE EXPLANATION DEFINING THE NECESSITY OF THE VARIANCE:

- AN EXPLANATION OF THE CURRENT OR PROPOSED CONDITION;
- WHY IT DOES NOT CONFORM WITH THE RULE;
- WHAT WOULD BE NECESSARY TO COMPLY WITH THE RULE;
- BACKGROUND INFORMATION ABOUT THE CONDITION;
- HOW IT HAS AFFECTED LIFE, HEALTH AND SAFETY

Click here to enter text.

B. PROVIDE DEFINITIVE INFORMATION AS TO WHY THE VARIANCE CAN BE GRANTED WITH NO ADDITIONAL OR UNDUE THREAT TO THE HEALTH AND SAFETY OF THE PUBLIC, SUCH AS:

- OPERATIONAL HISTORY;
- HISTORY OF SIMILAR CONDITIONS;
- EXPERT TESTIMONY; OR,
- AN ALTERNATIVE SOLUTION TO PROTECT THE PUBLIC.

Click here to enter text.

5. RECOMMENDED ALTERNATIVE MEANS TO ACHIEVE EQUIVALENT PROTECTION

- PROCESS, PROCEDURE, OR EQUIPMENT TO BE IMPLEMENTED;

Click here to enter text.

6. HAZARD ANALYSIS EVIDENCING RISK MITIGATION AND IDENTIFICATION OF RESIDUAL RISK :

- NEED TO IDENTIFY RISK IN CURRENT STATE;
- NEED TO IDENTIFY RISK AFTER IMPLEMENTATION;
- NEED TO IDENTIFY RESIDUAL RISK AFTER IMPLEMENTATION

Click here to enter text.

7. COST ESTIMATE

- INCLUDE ALL COSTS ASSOCIATED (PLANNING,PROCUREMENT, SHIPPING, INSTALLATION, O&M, OTHER)
- PLEASE ADD A NOTE ABOUT LIFE EXPECTANCY IF EQUIPMENT/REPAIR INCLUDED

Click here to enter text.

PEER REVIEW AND RECOMMENDATION

PEER REVIEW COMMENTS:

Click here to enter text.

Click here to enter text.

REVIEWER ELECTRONIC SIGNATURE

Click here to enter a date.

DATE

RECOMMENDATION: ☐ CONCUR ☐ DO NOT CONCUR

NATIONAL SCIENCE FOUNDATION (NSF) APPROVAL

NSF COMMENTS:

Click here to enter text.

Click here to enter text.

NSF OPP SAFETY OFFICER

Click here to enter a date.

DATE

NAME: Click here to enter text.

TITLE: Click here to enter text.